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Department of Electronics and Communication Engineering
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I B.Tech. I Semester

S.No.	Course Code	Course Title	L	T	P	Credits
1.	A221001	Mathematics-I(Linear Algebra & Calculus)	3	1	0	4
2.	A221002	Applied Physics	3	1	0	4
3.	A221501	C Programming for Engineers	3	0	0	3
4.	A221003	English for Skill Enhancement	2	0	0	2
5.	A221381	Engineering Workshop	0	1	3	2.5
6.	A221401	Elements of Electronics and Communication Engineering	0	0	2	1
7.	A221081	Applied Physics Laboratory	0	0	3	1.5
8.	A221082	English Language and Communication Skills Laboratory	0	0	2	1
9.	A221581	C Programming for Engineers Laboratory	0	0	2	1
10.		Induction Programme				
		Total	**11**	**3**	**12**	**20**

I B.Tech. II Semester

S.No.	Course Code	Course Title	L	T	P	Credits
1.	A221005	Mathematics-II (Ordinary Differential Equations and Vector Calculus)	3	1	0	4
2.	A221006	Engineering Chemistry	3	1	0	4
3.	A222303	Engineering Graphics & Modeling	1	0	4	3
4.	A222204	Basic Electrical Engineering	2	0	0	2
5.	A222402	Electronic Devices and Circuits	2	0	0	2
6.	A222583	Python Programming Laboratory	0	2	2	3
7.	A222084	Engineering Chemistry Laboratory	0	0	2	1
8.	A222283	Basic Electrical Engineering Laboratory	0	0	2	1
		Total	**11**	**4**	**10**	**20**

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II B.Tech. I Semester

S.No.	Course Code	Course Title	L	T	P	Credits
1	A223403	Analog Circuits	3	0	0	3
2	A223404	Network analysis and Transmission Lines	3	0	0	3
3	A223405	Digital Logic Design	3	0	0	3
4	A223406	Signals and Systems	3	1	0	4
5	A223407	Probability Theory and Stochastic Processes	3	0	0	3
6	A223481	Digital logic Design Laboratory	0	0	2	1
7	A223482	Basic Simulation Laboratory	0	0	2	1
8	A223483	Electronic Devices and Analog Circuits Laboratory	0	0	2	1
9	A223009	Professional Communication	2	0	0	1
		Total Credits	**17**	**1**	**6**	**20**

II B.Tech. II Semester

S.No.	Course Code	Course Title	L	T	P	Credits
1	A224010	Complex analysis and Fourier transforms	3	0	0	3
2	A224408	Electromagnetic Waves	3	0	0	3
3	A224409	Analog and Digital Communications	3	0	0	3
4	A224410	Linear IC Applications	2	0	0	2
5	A224411	Electronic Circuit Analysis	3	0	0	3
6	A224484	Analog and Digital Communications Laboratory	0	0	2	1
7	A224485	Linear IC Applications Laboratory	0	0	2	1
8	A224486	Electronic Circuit Analysis Laboratory	0	0	2	1
9	A2244P1	Real Time Project/Field Based Project	0	0	4	2
10	A224011	Quantitative methods & logical reasoning	2	0	0	1
		Total Credits	**16**	**0**	**10**	**20**

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III B.Tech. I Semester

S.No.	Course Code	Course Title	L	T	P	Credits
1	A225414	Microprocessors and Microcontrollers	3	1	0	4
2	A225415	Control Systems	3	1	0	4
3	A225416	Antennas and Wave Propagation	3	0	0	3
4		**Professional Elective–I**	3	0	0	3
	A225417	1.Computer Organization and Operating Systems				
	A225418	2.Data Communications and Computer Networks				
	A225419	3.Information Theory and Coding				
5		**Open Elective–I**	3	0	0	3
	A225420	1. Introduction to Micro controllers				
	A225421	2. Electronic Measuring Instruments				
	A225422	3. Digital Electronics for Engineering				
6	A225488	Microprocessors and Microcontrollers Laboratory	0	0	2	1
7	A225087	Advanced English Communication Skills Laboratory	0	0	2	1
8	A225489	Antenna Laboratory	0	0	2	1
9	A225016	Environmental Science	2	0	0	0
		Total Credits	**17**	**2**	**6**	**20**

III B.Tech. II Semester

S.No.	Course Code	Course Title	L	T	P	Credits
1	A226423	Digital Signal Processing	3	0	0	3
2	A226018	Business Economics & Financial Analysis	3	0	0	3
3	A226424	CMOS VLSI Design	3	0	0	3
4		**Professional Elective-II**	3	0	0	3
	A226425	1. Digital Image Processing				
	A226426	2. Mobile Communications and Networks				
	A226427	3. Embedded System Design				
5		**Open Elective–II**	3	0	0	3
	A226428	1. Fundamentals of Internet of Things				
	A226429	2. Electronics for Health Care				
	A226430	3. Telecommunications for Society				
6	A226490	VLSI Laboratory	0	0	2	1
7	A226491	Embedded system Design Laboratory	0	0	2	1
8	A226492	Digital Signal Processing Laboratory	0	0	2	1
9	A2264P1	Industry Oriented Mini Project/Internship	0	0	4	2
10	A226019	Gender Sensitization	2	0	0	0
		Total Credits	**17**	**0**	**10**	**20**

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IV B.Tech. I Semester

S.No.	Course Code	Course Title	L	T	P	Credits
1	A227431	Microwave and Optical Communications	3	1	0	3
2	A227432	Electronic Measurements and Instrumentation	3	0	0	3
3		**Professional Elective–III**	3	0	0	3
	A227433	1.Radar Systems				
	A227434	2.CMOS Analog IC Design				
	A227435	3.Artificial Neural Networks				
4		**Professional Elective–IV**	3	0	0	3
	A227436	1.Network Security and Cryptography				
	A227437	2.Satellite Communications				
	A227438	3.Biomedical Instrumentation				
5		**Open Elective–III**	3	0	0	3
	A227439	1. Principles of Signal Processing				
	A227440	2. Communication Technologies				
	A227441	3. IOT for Real Time Applications				
6	A227493	Microwave and Optical Communications Laboratory	0	0	4	2
7	A2274PS1	Project Stage–I	0	0	6	3
		Total Credits	**15**	**1**	**10**	**20**

IV B.Tech. II Semester

S.No.	Course Code	Course Title	L	T	P	Credits
1		**Professional Elective–V**	3	0	0	3
	A228442	1.Artificial Intelligence				
	A228443	2.5G and beyond Communication				
	A228444	3.Machine Learning				
2		**Professional Elective–VI**	3	0	0	3
	A228445	1.Multimedia Database Management Systems				
	A228446	2.System On-Chip Architecture				
	A228447	3.Wireless Sensor Networks				
3	A2284CV	Comprehensive Viva-Voce	0	0	0	3
4	A2284PS2	Project Stage–II	0	0	22	9
5	A2284TS	Technical Seminar	0	0	0	2
		Total Credits	**6**	**0**	**22**	**20**

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Department of Electronics and Communication Engineering

ANALOG CIRCUITS

II B.Tech I Semester **Course Code: A223403**

L	T	P	C
3	0	0	3

Course Outcomes:

After going through this course the student can

1. Design the amplifiers with various biasing techniques.
2. Design single stage amplifiers using BJT and FET
3. Design multistage amplifiers and understand the concepts of High Frequency Analysis of BJT.
4. Utilize the Concepts of negative feedback to improve the stability of amplifiers.
5. Utilize the Concepts of positive feedback to provide sustained oscillations.

UNIT-I

BJT Biasing: Transistor Biasing and Stabilization - Operating point, DC & AC load lines, Biasing –Fixed Bias, Self-Bias, Bias Stability, Bias Compensation using Diode

BJT Small Signal Model: Transistor Hybrid model, Determination of h-parameters from transistor characteristics, Typical values of h- parameters in CE, CB and CC configurations, Transistor at High Frequency: Hybrid –π model of Common Emitter transistor model, fα, fβ and unity gain bandwidth, Gain-bandwidth product.

UNIT-II

BJT Amplifiers: Transistor amplifying action, Analysis of CE, CC, CB Amplifiers and CE Amplifier with emitter resistance, low frequency response of BJT Amplifiers, effect of coupling and bypass capacitors on CE Amplifier.

FET Amplifiers: Analysis of CS, CD, CG JFET Amplifiers, comparison of performance with BJT Amplifiers, Basic Concepts of MOSFET Amplifier.

UNIT-III

Multistage Amplifiers: Classification of Amplifiers, Distortion in amplifiers, Different coupling schemes used in amplifiers, Frequency response and Analysis of multistage amplifiers, Cascade RC Coupled amplifiers, Cascode amplifier, Darlington pair.

UNIT-IV

Feedback Amplifiers: Concepts of feedback–Classification of feedback amplifiers–
General characteristics of Negative feedback amplifiers – Effect of Feedback on Amplifier characteristics –Voltage series, Voltage shunt, Current series and Current shunt Feedback configurations – Simple problems.

UNIT-V

Oscillators: Condition for Oscillations, RC type Oscillators-RC phase shift and Wien-bridge Oscillators, LC type Oscillators–Generalized analysis of LC Oscillators, Hartley And Colpitts Oscillators, Frequency and amplitude stability of Oscillators, Crystal Oscillator.

TEXTBOOKS:

1. Jacob Millman, Christos CH alkias-Integrated Electronics, McGraw Hill Education.
2. Robert L.Boylestead, Louis Nashelsky –Electronic Devices and Circuits
3. theory,11thEdition,2009,Pearson

REFERENCEBOOKS:

1. David A.Bell–ElectronicDevicesandCircuits,5th Edition,Oxford.
2. Adel S.Sedra, Kenneth C.Smith-Microelectronic Circuits- Theory and Applications,
3. Oxford. Chinmoy Saha, Arindam Halder, Debaati Ganguly-Basic Electronics-
4. Principles andApplications, 2018, Cambridge.

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Department of Electronics and Communication Engineering

NETWORK ANALYSIS AND TRANSMISSION LINES

II B.Tech I Semester **Course Code: A223404**

L	T	P	C
3	0	0	3

COURSE OUTCOMES:

After going through this course the student can

1. Recite basic concepts of network parameters, theorems and transmission line theory.
2. Differentiate the changes of transient networks using Laplace transform
3. Compare and contrast the parameters, functions and synthesis of the network
4. Apply the concepts of theorems on networks and transmission line theory to solve impedance matching issues.
5. Solve the transmission lines and matching circuits problems using Smith chart

UNIT-I:
Network Theorems:
Source transformation - Superposition Theorem - Thevenin's theorem - Norton's theorem - Reciprocity theorem - Maximum power transfer theorem

UNIT-II:
Transient Analysis:
Transient response of RL, RC, RLC Circuits (Series and Parallel combinations) for DC excitations, Initial Conditions, Solution using Differential Equations approach and Laplace Transform Method. Transient response for different inputs such as step, ramp, pulse and impulse by using Laplace transforms method.

UNIT – III:
Two Port Networks:
Impedance Parameters, Admittance Parameters, Hybrid Parameters, Transmission (ABCD) Parameters, ***g*** parameters, Conversion of one of Parameter to another, Conditions for Reciprocity and Symmetry, Inter Connection of Two Port networks in series, Parallel and Cascaded configurations, Illustration problems.

UNIT – IV:
Transmission Lines - I:
Types, Parameters, Transmission Line Equations, Primary & Secondary Constants, Equivalent Circuit, Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line Concepts, Lossless / Low Loss Characterization, Types of Distortion, Condition for Distortion less line, Minimum Attenuation, Loading - Types of Loading.

UNIT- V:
Transmission Lines – II:
Input Impedance Relations, SC and OC Lines, Reflection Coefficient, VSWR. $\lambda/4$, $\lambda/2$, $\lambda/8$ Lines – Impedance Transformations, Smith Chart – Configuration and Applications, Single Stub Matching.

TEXT BOOKS:

1. Abhijith Chakra barthi , Circuit Analysis and Synthesis, Dhanpat Rai and Company, 2018.
2. Umesh Sinha, Transmission Lines and Networks, Satya prakash Publications, 2010

REFERENCE BOOKS:

1. Van Valken Burg , Network Analysis , Pearson, 2016
2. Ryder J D, Networks, Lines and Fields, Prentice Hall India, 1999.

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Department of Electronics and Communication Engineering

DIGITAL LOGIC DESIGN

II B.Tech I Semester **Course Code: A223405**

L	T	P	C
3	0	0	3

COURSE OUTCOMES:

At the end of the course the student should be able to

1. Demonstrate the basic theorems of Boolean algebra, logic gates, combinational and sequential circuits and memories.
2. Analyze the combinational and sequential circuits and memories.
3. Design of logic circuits
4. Realization of gates using different logic families.
5. Explain the design and operation of different semiconductor memories

UNIT-I:
Number System and minimization techniques:
Number System:
Review of number system and base conversion, complements, signed binary numbers, Floating point number representation, Error detection (parity detection only).
Minimization techniques
Boolean Algebra**,** postulates ,basic logic gates, Canonical and Standard Form, NAND and NOR implementation, Minimization of switching function using theorem, The Karnaugh Map Method-Up to Five Variable Maps, Tabular Method.

UNIT-II:
Combinational Circuits:
Adders & Subtractor, Binary Adder-Subtractor, Decimal Adder, Binary Multiplier, Magnitude Comparators, Multiplexers, De-multiplexers, Decoders, Encoders and Code converters, Hazards and Hazard Free Relations.

UNIT-III:
Sequential circuits-I:
Basic Architectural Distinctions between Combinational and Sequential circuits, Latches, Flip Flops: SR, JK, Race Around Condition in JK, JK Master Slave, D and T Type Flip Flops, Excitation Table of all Flip Flops, Design of a Clocked Flip-Flop, Timing and Triggering Consideration, Clock Skew, Conversion from one type of Flip-Flop to another.

Unit-IV:
Sequential Circuits-II:
Synchronous – Asynchronous – Comparison, Design of Single mode Counter, Ripple Counter, Ring Counter, Shift Register, Shift Register Sequences, Ring Counter Using Shift Register, MOD Counters. Finite state machine**-**capabilities and limitations, Mealy and Moore models.

UNIT-V:

Logic Families and Semiconductor Memories:

Logic Families:

DCTL, RTL, DTL, TTL and CML Logic –gate realization - Comparison,

Semiconductor Memories:

Introduction to ROM, PAL, PLA, CPLD, FPGA.

TEXT BOOKS:

1. Morris Mano , Digital Design, Prentice Hall India, 2006
2. A Anand Kumar, Switching Theory and Logic Design, Prentice Hall India, 2013

REFERENCE BOOKS:

1.Jain N P, Modern Digital Electronics, Tata McGraw Hill, 2007.
2.Fredriac J. Hill, Gerald R. Peterson, Introduction to Switching Theory and Logic Design Wiley, 1981.

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Department of Electronics and Communication Engineering

SIGNALS AND SYSTEMS

II B.Tech I Semester **Course Code: A223406**

L	T	P	C
3	1	0	4

COURSE OUTCOMES:

After going through this course the student will be able to:

1. Understand the Mathematics, operations and classification of signals and systems
2. Apply the transform on standard and arbitrary signals
3. Infer the signal transmission through linear systems
4. Interpret the concepts of Laplace Transform and Z-Transform in analysis of systems.
5. Understand the process of sampling and the effects of under sampling.

UNIT I:

Signal Analysis:

Analogy between Vectors and Signals, Orthogonal Signal Space, Signal approximation using Orthogonal functions, Mean Square Error, Closed or complete set of Orthogonal functions, Orthogonality in Complex functions, Classification of Signals and systems, Exponential and Sinusoidal signals, Concepts of Impulse function, Unit Step function, Signum function.

UNIT II:

Fourier series &Fourier Transforms:

Representation of Fourier series, Continuous time periodic signals - Dirichlet's conditions, Trigonometric Fourier Series and Exponential Fourier Series, Complex Fourier spectrum.
Deriving Fourier Transform from Fourier series, Fourier Transform of arbitrary signal - standard signals - Periodic Signals – Properties - Introduction to Hilbert Transform.

UNIT III:

Signal Transmission through Linear Systems:

Linear System, Impulse response, Response of a Linear System, Linear Time Invariant(LTI) System, Linear Time Variant (LTV) System, Transfer function of a LTI System, Filter characteristic of Linear System, Distortion less transmission through a system, Signal bandwidth, System Bandwidth, Ideal LPF, HPF, and BPF characteristics, Causality and Paley-Wiener criterion for physical realization, Relationship between Bandwidth and rise time.

UNIT IV:

Laplace Transforms:

Laplace Transforms (L.T), Inverse Laplace Transform, Concepts of Region of Convergence (ROC) for Laplace Transforms, Properties of L.T, Relation between L.T and F.T of a signal, Laplace Transform of certain signals using waveform synthesis.

UNIT V:

Sampling Theorem and Z–Transforms:

Graphical and analytical proof for Band Limited Signals, Impulse Sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, Effect of under sampling – Aliasing, Introduction to Band Pass Sampling.

Concept of Z-Transform of a Discrete Sequence, Distinction between Laplace, Fourier and Z Transforms, Region of Convergence in Z-Transform, Constraints on ROC for various classes of signals, Inverse Z-transform, Properties of Z-transforms.

TEXT BOOKS:

1. Lathi B P, Signals, Systems & Communications, B.S. Publications, 2003.
2. Alan V. Oppenheim, Alan S. Willsky, Syed Hamid Nawab , Signals and Systems, PrenticeHall India,1997

REFERENCE BOOKS:

1. Simon S. Haykin, Barry Van Veen , Signals and Systems, Wiley, 2003
2. Rama Krishna Rao A, Signals and Systems, 2008, Tata McGraw Hill, 2008.

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PROBABILITY THEORY AND STOCHASTIC PROCESSES

II B.Tech I Semester **Course Code: A223407**

L	T	P	C
3	0	0	3

COURSE OUTCOMES:

After going through this course the student will be able to

1. Demonstrate knowledge in Probability theory, Single and multiple random variables and Random processes and their characteristics
2. Analyze operations on single and multiplier and om variables and processes
3. Compute Simple probabilities using an appropriate sample space, Expectations from probability density functions, Least-square & maximum likelihood estimators for engineering problems Mean and Covariance functions for simple random processes.
4. Designsolutionsforcomplexengineeringproblemsinvolvingrandomprocesses.
5. Understand how random variables and stochastic processes can be described and analyzed

UNIT-I:
Probability & Random variables:
Probability:
Probability introduced through Sets and Relative Frequency: Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Joint Probability, Conditional Probability, Total Probability, Bay's Theorem,Independent Events.
Random Variable:
Definition, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variable, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Methods of defining Conditioning Event, Conditional Distribution, Conditional Density and their Properties.

UNIT-II:
Operations on single & multiple random variables– expectations:
Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Chebychev's Inequality, Characteristic Function, Moment Generating Function, Joint Distribution Function and its Properties, Marginal Distribution Functions, Conditional Distribution and Density – Point Conditioning, Conditional Distribution and Density – Interval conditioning, Statistical Independence, Sum of Two and more Random Variables, Central Limit Theorem, Equal and Unequal Distribution. Expected Value of a Function of Random Variables- Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions

UNIT-III:
Random processes – Temporal characteristics:
The Random Process Concept, Classification of Processes, Deterministic and Non deterministic Processes, Distribution and Density Functions, concept of Stationarity and Statistical Independence. First-Order Stationary Processes, Second- Order and Wide- Sense Stationarity, (N-Order) and Strict-Sense Stationarity, Time Averages and Ergodicity, Mean-

Ergodic Processes, Correlation-Ergodic Processes, Autocorrelation Function and Its Properties, Cross-Correlation function and Its Properties, Random Signal Response of Linear Systems: System Response–Mean and Mean-squared Value of System Response, autocorrelation Function of Response, Cross-Correlation Functions of Input and Output.

UNIT-IV:

Random processes – Spectral characteristics:

The Power Spectrum: Properties, Relationship between Power Spectrum and Autocorrelation Function, the Cross-Power Density Spectrum, Properties, Relationship between Cross–Power Spectrum and Cross-Correlation Function. Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output.

UNIT-V:

Noise sources:

Resistive/Thermal Noise Source, Arbitrary Noise Sources, Effective Noise Temperature, Noise equivalent bandwidth, Average Noise Figures, Average Noise Figure of cascaded networks, Narrow Band noise, Quadrature representation of narrow band noise & its properties.

TEXT BOOKS:

1. Peyton Z. Peebles , Probability, Random Variables & Random Signal Principles,Tata McGraw Hill, 2001.
2. Taub and Schilling , Principles of Communication systems , Tata McGraw Hill,2008

REFERENCE BOOKS:

1. Athanasios Papoulis and S. Unnikrishna Pillai, Probability, Random Variables andStochastic Processes, Prentice Hall India, 2002.
2. Murugesan K, Guruswamy P, Probability, Statistics & Random Processes,Anuradha Publications,2003.

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DIGITAL LOGIC DESIGN LABORATORY

II B.Tech I Semester **Course Code: A223481**

L	T	P	C
0	0	2	1

Course Outcomes:
Upon completing this course, the students will be able to

1. Design of all logic gates by using universal gates.
2. Design of adder and subtractor by using logic gates.
3. Design of MSI combinational circuits by using logic gates.
4. Design and analyze counters by using flip-flops.
5. Analyze the universal shift register.

List of Experiments
Note: Minimum 10 Experiments have to be conducted

1. Design of all logic gates using NAND/NOR gates and verify the truth tables.
2. Realization of Boolean Expressions using Logic Gates.
3. Design full adder & full subtractor using NAND/NOR gates and verify the truth table.
4. Verification of 4-bit Parallel adder /subtractor circuit.
5. Design of 4-bit gray to binary code converter.
6. Design any 4 variable functions using 8:1 Multiplexer and verify.
7. Design and realization 2-bit comparator.
8. Verification of 4-bit Magnitude comparator
9. Design full adder using 3*8 Decoder and verify.
10. Design T & D flip flops using JK flip flop and verify the truth table.
11. Verification of 4-bit Decade counter
12. Verification of Universal Shift Register

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Department of Electronics and Communication Engineering

BASIC SIMULATION LABORATORY

II B.Tech I Semester **Course Code: A223482**

L	T	P	C
0	0	2	1

COURSE OUTCOMES:

After going through this course the student will be able to:

1. Evaluate the operation on signals and systems using arithmetic operations and transforms
2. Application of correlation and transforms on noise removal and signal extraction
3. Compute various statistical properties of a random noise and verify whether it is stationary
4. Determine the correlation & Convolution between Signals and sequences.
5. Validate the properties and waveform synthesis of various transforms

Minimum 10 experiments to be Simulated Using MATLAB:

1. Generation of various signals and sequences (Periodic and A periodic), such as Unit Impulse, Unit step, square, saw tooth, Triangular, Sinusoidal, Ramp, Sync.
2. Operations on Signals and Sequences such as Addition, multiplication, scaling, Shifting, Folding, computation of Energy and average power.
3. Finding the Even and Odd parts of Signal/sequence and Real and imaginary parts of signal.
4. Convolution between signals and sequences.
5. Auto correlation and cross correlation between signals and sequences.
6. Verification of Linearity and Time Invariance Properties of a given continuous/Discrete system.
7. Gibbs Phenomenon.
8. Finding the Fourier Transform of a given signal and plotting its magnitude and phase spectrum.
9. Waveform synthesis using Laplace Transform.
10. Locating the Zeros and Poles and plotting the Pole-Zero maps in S plane and Z-plane for the given transfer function.
11. Generation of Guassian noise (Real and complex), Computation of its mean, M.S. value and its Skew, Kurtosis, and PSD, probability distribution function.
12. Sampling Theorem Verification.

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Department of Electronics and Communication Engineering

ELECTRONIC DEVICES AND ANALOG CIRCUITS LABORATORY

II B.Tech I Semester **Course Code: A223483**

L	T	P	C
0	0	2	1

COURSE OUTCOMES:

After going through this course the student will be able to:

1. Outline the characteristics of different semiconductor devices.
2. Interpret the ripple factor, regulations of rectifiers.
3. Sketch the frequency response of small signal amplifiers.
4. Understand the concepts of UJT and observe its characteristics.
5. Design and analyze oscillator circuits.

Note: Minimum of 10 experiments:

1. Forward & Reverse Bias Characteristics of PN Junction Diode.
2. Zener diode characteristics.
3. Half Wave Rectifier with & without filters.
4. Full Wave Rectifier with & without filters.
5. Input & Output Characteristics of Transistor in CE Configuration
6. FET characteristics.
7. Clippers Clampers
8. UJT Characteristics
9. Frequency Response of CE Amplifiers
10. Frequency Response of Common Source FET amplifier.
11. Two Stage RC Coupled amplifiers
12. RC Phase shift Oscillator

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Department of Electronics and Communication Engineering

PROFESSIONAL COMMUNICATION

II B.Tech I Semester **Course Code: A223009**

L	T	P	C
2	0	0	1

COURSE OUTCOMES:

After going through this course the student can

1. Acquire enhanced personality
2. Demonstrate appropriate professional etiquette
3. Practice team building with strong communication skills
4. Develop problem solving skills and decision-making
5. Exhibit effective communication on digital platforms

Unit: I: Introduction to Soft Skills

Soft Skills for personal and professional development
Self Introduction in various situations
SWOC Analysis
Goal setting

Unit: II: Professional Etiquette

Etiquette-Mobile Etiquette- Netiquette
Non-Verbal Communication
Presentations – Individual & Team
Time Management

Unit: III: Team Essentials

Leadership Skills
Team Building
Negotiation Skills
Group Discussion-Functional Aspects

Unit: IV: Decision Making & Problem Solving

Logical Thinking
Decision Making
Problem Solving
Critical Thinking

Unit: V: Digital Communication

Role of Multimedia in Communication
E-Mail
Social Networking: Importance and Effects.
Communication in Corporate World

References Books:

1. Ashrif Rizvi, Effective Technical Communication, Tata Mac Graw Hill, 2018.
2. Barun, K Mitra, Personality Development and Soft Skills, Oxford University Press, 2nd Edition, 2017.

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Department of Electronics and Communication Engineering

COMPLEX ANALYSIS AND FOURIER TRANSFORMS

II B.Tech II Semester **Course Code: A224010**

L	T	P	C
3	0	0	3

Course Outcomes: After learning the contents of this course the students must be able to:

1. Work with the functions of complex variables and evaluation of complex differentiation.
2. Acquire the knowledge of complex power series and integration.
3. Apply the knowledge of contour integration to evaluate real integrals in engineering problems and acquire the knowledge of evaluating of conformal mapping and bilinear transformations.
4. Studying of Fourier series and defining it for various types of functions.
5. Apply Fourier sine and cosine integral theorems for a given function f(x) evaluate Fourier transforms, sine and cosine transforms.

UNIT-I:

Functions of Complex Variables:

Introduction, Complex functions - limits and Continuity-Differentiability, Analytic functions and Properties, Cauchy-Riemann Equations (Cartesian and Polar), Harmonic functions, Construction of analytic functions.

UNIT-II:

Complex Integration:

Introduction, Complex integration-Line integral, Cauchy's integral theorem, Cauchy's integral formula, Generalized Cauchy's integral formula, Power series: Taylor's series, Laurent series, Singular points, Types of Singularities, Residue, Cauchy's Residue theorem.

UNIT-III:

Evaluation of Integrals & Conformal Mapping:

Introduction,-Evaluation of improper real integrals of the type (a) $\int_{-\infty}^{\infty} f(x)dx$ (b) $\int_{c}^{c+2\pi} f(\cos\theta, \sin\theta)d\theta$ -

Conformal Mapping,-Critical Points-Bilinear transformation – fixed point – cross ratio - properties - invariance of circles.

UNIT-IV:

Fourier series:

Introduction- Periodic functions- Fourier series of periodic function- Dirichlet's conditions- Even and odd functions- Change of interval- Half-range sine and cosine series.

UNIT-V:

Fourier Transforms:

Introduction- Fourier integral theorem (without proof)- Fourier integrals in complex form- Standard results- Fourier sine and cosine integrals- Fourier Transforms- Infinite and finite Fourier Transforms- Properties- Fourier sine and cosine transforms- inverse transforms, Finite Fourier transforms.

Textbooks:

1. Higher Engineering Mathematics by Dr. B. S. Grewal, Khanna Publishers.
2. A text book of Engineering Mathematics by N.P.Bali, Manesh Goyal Laxmi Publications

Reference Books:

1. Advanced Engineering Mathematics : Kreyszig, John Wiley & sons
2. Fundamentals of Complex Analysis by Saff, E. B. and A. D. Snider, Pearson.
3. Functions of Complex Variables by J.N.Sharma, Krishna Prakashan Media.

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Department of Electronics and Communication Engineering

ELECTROMAGNETIC WAVES

II B.Tech II Semester **Course Code: A224408**

L	T	P	C
3	0	0	3

COURSE OUTCOMES:

At the end of the course the student should be able to

1. Understand the electric field due to different charge distributions.
2. Demonstrate the EM Field Characteristics divergence and curl of fields.
3. Interpret the Maxwell's equations for static Electric and Magnetic fields and dynamic Electromagnetic fields.
4. Analyze the behavior of EM waves in different media.
5. Solving Engineering problems on EM Wave Propagation.

UNIT I: Electrostatics-I:
Introduction to Vectors and Coordinate system- Coulomb 's Law- Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications, Electric Potential, Relation between E and V, Maxwell's Two Equations for Electrostatic Fields, Energy Density in Electrostatics.

Unit-II: Electrostatics-II:
Convection and Conduction Currents, Dielectric Constant, Dielectric polarization, Linear, Isotropic and Homogeneous Dielectrics, Continuity Equation, Relaxation Time, Poisson 's and Laplace 's Equations, Capacitors – Parallel Plate, Coaxial, Spherical, boundary conditions in static electric field, Uniqueness theorem.

UNIT III: Magneto statics:
Biot-Savart's Law-Magnetic Field Intensity due to finite length current carrying conductor, Ampere's Circuit Law and Applications, Magnetic Flux Density, Maxwell's two Equations for Magneto static Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere's Force Law, Magnetostatic boundary conditions.

UNIT IV: EM Wave Characteristics -I (Time-Varying Maxwell's Equations):
Faraday's Law and Transformer EMF, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in Different Forms, Time-varying Boundary Conditions at a Surface -Dielectric-Dielectric and Dielectric-Conductor Interfaces, Lorentz condition for Time-varying potentials.

UNIT V: EM Wave Characteristics –II:
Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definitions, Relation between E & H, Sinusoidal Variations, Wave Propagation in Conductor & Dielectric media, Polarization. Reflection and Refraction of Plane Waves – Normal and Oblique Incidences for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance, Poynting Vector and Poynting Theorem.

TEXT BOOKS:

1. Matthew N.O. Sadiku and S.V. Kulkarni, Elements of Electromagnetic, Tata McGraw Hill,2020.
2. E.C. Jordan and K.G. Balman, Electromagnetic Waves and Radiating Systems, PHI,2000.

REFERENCE BOOKS:

1. Engineering Electromagnetics – William H. Hayt Jr. and John A. Buck, McGrawHill, 2014.
2. Engineering Electromagnetics – Nathan Ida, Springer (India) Pvt. Ltd., New Delhi, 2005.

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Department of Electronics and Communication Engineering

ANALOG AND DIGITAL COMMUNICATIONS

II B.Tech II Semester **Course Code: A224409**

L	T	P	C
3	0	0	3

COURSEOUTCOMES:

After going through this course the student can

1. Demonstrate fundamental knowledge in elements of Analog and Digital Communication systems.
2. Analyze different types of analog and digital modulation systems and calculate total power & bandwidth.
3. Design an efficient Transmitter and Receiver based on SNR, bandwidth and equipment complexities.
4. Formulate and solve engineering problems in the core area of analog and digital communications in developing information transmitting systems and telemetry system.
5. Illustrate the impact of noise in analog communication systems and computation of Probability of error in digital modulation techniques.

UNIT-I:

Amplitude Modulation - I:

Review of signals and systems, Amplitude Modulation: Time and Frequency domain representations–Power and Bandwidth, AM Generators: Square law modulator-Switching modulator, AM Detectors: Square law detector – Envelope detector, DSBS Modulation: Time domain and frequency domain representations, DSB-SC Generators: Balanced Modulators-Ring Modulator, DSB-SC Detectors: Coherent detector-COSTAS Loop, Output SNR & Noise figure in AM system.

UNIT-II:

Amplitude Modulation - II:

SSB Modulation: Time and Frequency domain representations-SSB Generators and Detectors, VSB Modulation: Time and Frequency domain representation- Envelope detection of a VSB wave, Comparison and Applications of different AM Systems, Output SNR & Noise figure in DSBSC & SSB systems, Frequency Division Multiplexing.

UNIT-III:

Frequency Modulation:

Angle Modulation: Time domain representation – Single tone FM wave- NBFM and WBFM-Spectral analysis of single tone FM Wave – Power and Bandwidth, FM Generators: Indirect FM and Direct FM Generators, FM Detectors: Balanced Frequency discriminator-Ratio detector, Pre-emphasis & De-emphasis, Threshold effect, Comparison of FM between AM, Output SNR & Noise figure in FM system..

UNIT-IV:

Pulse Analog and Digital Modulations:

Pulse Analog Modulation:

Sampling process, Pulse Amplitude Modulation and Demodulation, Pulse Width Modulation and demodulation, Pulse Position Modulation and Demodulation, Time Division Multiplexing.

Pulse Digital Modulation:
Quantization process, Pulse Code Modulation (PCM), Differential PCM (DPCM), Delta Modulation (DM), Output SNR in PCM and DM system, Comparison of PCM and DM Systems.

UNIT-V:
Pass band Digital Modulations:
Carrier Digital Modulation Schemes: ASK–PSK–DPSK-FSK–QAM, Probability of error, Error Probability in Optimal Coherent detection of PSK and FSK Modulations.

TEXTBOOKS:
1. Haykin S, Communications Systems, Wiley, 2001.
2. Sam Shanmugam, Digital and Analog Communication Systems, Wiley, 2006.

REFERENCEBOOKS:
1. Proakis JG, Digital Communications, McGraw Hill, 2000.
2. Kenndy–Davis, Electronics and Communication Systems, McGraw Hill 4th Edition, 2006.

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Department of Electronics and Communication Engineering

LINEAR IC APPLICATION

II B.Tech II Semester **Course Code: A224410**

L	T	P	C
2	0	0	2

COURSE OUTCOMES:

Upon completing this course, the student will be able to

1. Understand the overview of IC classifications and comparison of analog and digital IC's.
2. Understand the operating principle of operational amplifiers and working of its IC version.
3. Acquire the knowledge of active filter basics and applications of op-amps.
4. Attain the knowledge of functional diagrams and applications of IC555 and IC565.
5. Acquire the knowledge about the Data converters.

UNIT-I

Integrated Circuits: Classification, chip size and circuit complexity, basic information of Op-amp, ideal and practical Op-amp, internal circuits, Op-amp characteristics, DC and AC Characteristics, 741 op-amp and its features, modes of operation-inverting, non- inverting, differential.

UNIT-II

Op-amp and Applications: Basic information of Op-amp, instrumentation amplifier, ac amplifier, V to I and I to V converters, Sample & hold circuits, multipliers and dividers, differentiators and integrators, comparators, Schmitt trigger, Multivibrators, introduction to voltage regulators, features of 723.

UNIT-III

Active Filters & Oscillators: Introduction, 1st order LPF, HPF filters, Band pass, Band reject and all-pass filters. Oscillator types and principle of operation-RC, Wien and quadrature type, waveform generators-triangular, saw tooth, square wave and VCO.

UNIT-IV

Timers & Phase Locked Loops: Introduction to 555 timer, functional diagram, monostable and astable operations and applications, Schmitt Trigger. PLL - introduction, block schematic, principles and description of individual blocks of 565.

UNIT-V

D-A and A-D Converters: Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, and IC 1408 DAC, Different types of ADCs - Parallel comparator type ADC, counter type ADC, successive approximation ADC dualSlope integration type ADC, DAC and ADC specifications.

TEXT BOOKS:

1. Roy Choudhury D, Shail B. Jain, Linear Integrated Circuit, New Age International, 2012
2. Ramakant A. Gayakwad, OP-AMP and Linear Integrated Circuits, Prentice Hall India, 2012.

REFERENCE BOOKS:

1. Tony Chan Carusone, David A. Johns, Kenneth W. Martin, Analog Integrated Circuit Design, John Wiley & Sons Ltd, 2011.
2. Joseph Carr, Linear IC Applications: A Designer's Handbook, Reed Educational and Publishing Pvt.Ltd, 1996
3. S. Salivahanan, V.S. Kanchana Bhaskaran, Linear IC Applications, McGra Hill, 2020

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Department of Electronics and Communication Engineering

ELECTRONIC CIRCUIT ANALYSIS

II B.Tech II Semester **Course Code: A224411**

L	T	P	C
3	0	0	3

COURSE OUTCOMES:

Upon completing this course, the student will be able to

1. Design the power amplifiers
2. Design the tuned amplifiers and analyse its frequency response
3. Design Multivibrators and sweep circuits for various applications.
4. Design and understanding of time-base generators.
5. Utilize the concepts of synchronization, frequency division and sampling gates.

UNIT-I

Linear Wave Shaping: High pass, low pass RC circuits, their response for sinusoidal, step, pulse, square, and ramp inputs. High pass RC circuit as differentiator and Low pass RC circuit as integrator, attenuators.

Sampling Gates: Basic operating principles of Sampling Gates, Unidirectional and Bi-directional Sampling Gates, Four Diode Sampling Gate, Reduction of pedestal in Gate Circuits

UNIT-II

Large Signal Amplifiers: Class A Power Amplifier- Series fed and Transformer coupled, Conversion Efficiency, Class-B Power Amplifier- Push Pull and Complimentary Symmetry configurations, Conversion Efficiency, Principle of operation of Class-AB and Class–C and D Amplifiers.

UNIT-III

Tuned Amplifiers: Introduction, single Tuned Amplifiers – Q-factor, frequency response, Double Tuned Amplifiers–Q-factor, frequency response, Concept of stagger tuning and synchronous tuning

UNIT-IV

Multivibrators: Analysis and Design of Bistable, Monostable, Astable Multivibrators and Schmit ttrigger using Transistors.

UNIT-V

Time Base Generators: General features of a Time base Signal, Methods of Generating Time Base Waveform, concepts of Transistor Miller and Bootstrap Time Base Generator, Methods ofLinearity improvement.

TEXTBOOKS:

1. Jacob Millman, Christos C Halkias-Integrated Electronics, McGraw Hill Education.
2. J.Millman, H.Taub and Mothiki S.Prakash Rao- Pulse, Digital and Switching Waveforms–2nd Ed.,TMH,2008,

REFERENCEBOOKS:

1. David A.Bell-Electronic Devices and Circuits,5th Ed.,Oxford.
2. Robert L.Boylestead, Louis Nashelsky Electronic Devices and Circuits theory, 11thEd.,Pearson,2009
3. Ronald J. Tocci-Fundamentals of Pulse and Digital Circuits, 3rd Ed., 2008.
4. David A. Bell-Pulse, Switching and Digital Circuits, 5th Ed., Oxford, 2015.

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Department of Electronics and Communication Engineering

ANALOG AND DIGITAL COMMUNICATIONS LABORATORY

II B.Tech II Semester **Course Code: A224484**

L	T	P	C
0	0	2	1

COURSE OUTCOMES:

At the end of the course the student should be able to

1. Demonstrate knowledge in different Analog and Digital Communication Systems.
2. Compare the characteristics of various Analog and Digital modulation schemes and analyze the performances.
3. Develop various analog and digital modulation and demodulation systems
4. Explain how Pulse code modulation is applied to transform an analog signal into a digital one and transmitted through the digital communication network.
5. Design the shift keying based digital modulation techniques for the transmission of digital information

Note: Any 10 experiments to be conducted

1. Amplitude modulation and demodulation
2. DSBSC modulation and demodulation
3. SSB modulation and demodulation
4. Frequency modulation and demodulation
5. Pulse Amplitude Modulation and demodulation
6. Pre-emphasis and De-emphasis
7. Verification of Sampling Theorem
8. Pulse code modulation and demodulation
9. Delta modulation and demodulation
10. PSK Modulation and demodulation
11. FSK Modulation and demodulation
12. DPSK and QPSK Modulation and demodulation

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Department of Electronics and Communication Engineering

LINEAR IC APPLICATIONS LABORATORY

II B.Tech II Semester **Course Code: A224485**

L	T	P	C
0	0	2	1

COURSE OUTCOMES:

At the end of the course the student should be able to

1. Design and analyze filter circuits using op-amp.
2. Design and analyze the various linear application of op-amp.
3. Design and analyze the various application of 555 timer.
4. Design and analyze the performance of oscillators.
5. Design and analyze IC 565, IC 723 and converters.

Note: Minimum 10 Experiments have to be conducted

1. Design of 2-input adder and subtractor using IC 741.
2. Design of Integrator and Differentiator circuit using IC 741.
3. Design of first order LPF and HPF using IC 741.
4. Design of Astable multivibrator using IC 741.
5. Design of triangular wave generator using IC 741.
6. Design of RC phase shift oscillator using IC 741.
7. Design of Wein-bridge oscillator using IC 741.
8. Analyze the operation of Weighted resistor type DAC and R-2R Ladder type DAC
9. Design Astable Multivibrator Circuit using IC 555 Timer.
10. Design Monostable Multivibrator Circuit using IC 555 Timer.
11. Calculation of Capture Range & Lock Range Using IC 565 PLL
12. Design a Voltage Regulator using IC 723.

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Department of Electronics and Communication Engineering

ELECTRONICS CIRCUIT ANALYSIS LABORATORY

II B.Tech II Semester **Course Code: A224486**

L	T	P	C
0	0	2	1

COURSE OUTCOMES:

Upon completing this course, the students will be able to

1. Design power amplifiers and find its efficiency
2. Design tuned amplifiers and find its Q-factor
3. Design various multivibrators and sweep circuits.
4. Understand the Schmitt trigger response for various gain
5. Design the unidirectional bidirectional Sampling gates

Note: Minimum 10 Experiments have to be conducted

1. Design transformer coupled class A power amplifier and draw the input and output waveforms find its efficiency
2. Design class B power amplifier and draw the input and output waveforms, and find its efficiency.
3. Design the complementary symmetry push-pull amplifier and draw the input and output waveforms.
4. Design class C power amplifier and draw the input and output waveforms
5. Design a single tuned amplifier and determine the Q of its tuned circuit practically.
6. Design a Bistable Multivibrator and draw the wave forms at base and collector of transistors.
7. Design an Astable Multivibrator and draw the wave forms at base and collector of transistors.
8. Design a Monostable Multivibrator and draw the input and output waveforms
9. Design and Analyze the operation of Schmitt trigger circuit.
10. Design a Bootstrap sweep circuit using BJT and draw its output time base waveform
11. Design a Miller sweep circuit using BJT and draw its output time base waveform.
12. Design unidirectional and bidirectional sampling gates

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QUANTITATIVE METHODS & LOGICAL REASONING

II B.Tech II Semester **Course Code: A224011**

L	T	P	C
2	0	0	1

Course Outcomes: At the end of the completion of the course a student is expected –

1. To perform well in various competitive exams and placement drives.
2. To solve basic and complex mathematical problems in short time.
3. To become strong in Quantitative Aptitude and Reasoning which can be applied for GRE, GATE, GMAT or CAT exam also.
4. To develop problem solving skills and analytical abilities, which play a great role in corporate and industry set up.

Quantitative Aptitude and Reasoning:

Unit – I :

Number System: Speed Maths, Numbers, Factors, Prime & Co Primes, LCM & HCF, Divisibility Rules, Finding Unit Place Digit and Last Two Digits of an Expression

Ratio, Proportion and Variations: Definition of Ratio, Ratio of Proportion, Comparison of Ratios, Compound ratio, Direct and Indirect Proportion

Percentages: Converting Fractions and Decimal into Percentages, Successive Percentage, Populations, Expenditure and Savings

Profit and loss: Relation between Cost Price and Selling Price, Discount and Marked Price, Gain or Loss Percentages on Selling Price

Simple and Compound Interest: Problems on Interest (**I**), Amount (**A**), Principal (**P**) and Rate of Interest (**R**) difference between the Simple Interest and Compound Interest for 2 and 3 years.

Unit – II :

Partnership: Relation between Partners, Period of Investment and Shares

Averages, Ages and Allegation : Average of Different Groups, Change in Averages by Adding, Deleting and Replacement of Objects, Problems on ages, Allegation Rule, Mean Value of the Mixture, Replacement of Equal Amount of Quantity.

Time and Work: Men and Days, Work and Wages, Pipes and Cisterns, Hours and Work, Alternate Days Concept,

Time and Distance: Difference between the Average and Relative Speeds, Reaching the Destination Late and Early, Stoppage Time Per Hour, Time and Distance between Two Moving Bodies : Train Crossing Man - same and opposite directions, Speed of Boat and Stream,

Unit – III :

Progressions and Quadratic Equations : Arithmetic, Geometric and Harmonic Progressions, Arithmetic Mean, Geometric Mean and Harmonic Mean and their Relations. General form of Quadratic Equation, Finding the Roots of Quadratic Equation, Nature of the Roots.

Permutation and Combination: Fundamental Rules, Problems on Permutations & combinations.

Probability : Definition of probability, Notations and Formulae, Problems on Probability.

Data Interpretation and Data Sufficiency: Tabular and Pie-charts, Bar and Line Graphs, Introduction to Data Sufficiency, Problems on Data Sufficiency.

Unit – IV:

Deductions: Statements and conclusions using Venn diagram and Syllogism Method

Series completion: Number series, Alphabet series, Letter Series.

Coding and Decoding: Letter coding, Number coding, Number to letter coding, Matrix Coding, Substitution, Mixed Letter Coding, Mixed Number Coding, Deciphering Individual Letter Codes by Analysis.

Analytical Reasoning Puzzles:

Problems on Linear, Double line-up and Circular Arrangements, Selections and Comparisons.

Blood Relations:

Defining the various Relations among the Members of a Family, Solving Blood Relation Puzzles by using Symbols and Notations**.** Problems on Coded Relations.

Unit – V:

Direction sense Test: Sort of directions in puzzles distance between two points, problems on shadows, Application of triangular triplets.

Clocks: Relation between Minute-Hour Hands, Angle vs Time, Exceptional Cases in Clocks

Calendars: Definition of a Leap Year, Finding the Odd days, Finding the Day of any Random Calendar Date, repetition of Calendar Years.

Cubes and Dices: Finding the Minimum and Maximum Number of Identical Pieces and Cuts, Painting of Cubes and cuts, Problems on Dice.

Venn Diagrams: Circular Representation of given words, Geometrical Representation of Certain class, Set theory based Problems.

Text Books:

1. Verbal Reasoning, GL Barrons, Pinterest, Latest Edition 2019

2. A Modern Approach to Logical Reasoning & Quantitative Aptitude, R S Agarwal, S. Chand, Publications, Revised edition, 2019

Reference Books:

1. Quantitative Aptitude, G.L Barrons, Pinrest 2019

2. Quantitative Aptitude, Abhijit Guha, Mc Graw Hills, Edition 2019

3. Quantitative Aptitude, U. Mohan Rao SCITECH

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MICRO PROCESSORS AND MICRO CONTROLLERS

III B.Tech I Semester **Course Code: A225414**

L	T	P	C
3	1	0	4

COURSE OUTCOMES:

At the end of the course the student should be able to

1. Acquire knowledge about Microprocessors, Microcontroller and its need.
2. Ability to identify basic architecture of different Microprocessors & Microcontroller
3. Develop systems for interfacing of different peripheral devices microprocessor & Microcontrollers
4. Write a program to interface microprocessor and microcontroller for different applications.
5. Develop microcontroller application for different domain

UNIT-I:

8086 Architecture:
8086 Architecture-Functional diagram, Register Organization, Memory Banks, Memory Segmentation, Programming Model, memory addresses, Physical Memory Organization, Signal descriptions of 8086, Minimum & Maximum Mode configuration of 8086, Timing diagrams.

UNIT-II:

Instruction Set and Assembly Language Programming of 8086:
Instruction formats, Addressing modes, Instruction Set, Assembler Directives, Macros, Simple Programs involving Logical, Branch and Call Instructions, sorting, Evaluating Arithmetic Expressions, String Manipulations.

UNIT-III:

Interfacing RAM with 8086:
8255 PPI – Modes – Interfacing with 8086, 8251 – Modes - Interfacing with 8086, 8259 Interfacing with 8086, 8257 DMA – Modes, Interfacing 8086 with Stepper Motor and DAC 0800.

UNIT-IV:

Introduction to Microcontrollers:
Overview of 8051 Microcontroller, Architecture, I/0 Ports, Memory Organization, Addressing Modes and instruction set of 8051

UNIT-V:

8051 Real Time Control:

Timers/Counters, Serial Communication and Interrupts, Programming 8051 Timers and Counters, Programming the Serial Communication interrupts, Programming Timer Interrupts, Programming external Hardware Interrupts.

TEXT BOOKS:

1. Ray A K and Bhurchandani K M, Advanced Microprocessors and Peripherals , Tata McGraw-Hill, 2006.
2. Kenneth. J. Ayala, The 8051 Microcontroller ,Cengage Learning, 2005

REFERENCE BOOKS:

1. D. V. Hall, Microprocessors and Interfacing, Tata McGraw-Hill, 2006
2. Uma Rao K., Andhe Pallavi , The 8051 Microcontrollers, Architecture and Programming and Applications, Pearson, 2009

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CONTROL SYSTEMS

III B.Tech I semester **Course Code: A225415**

L	T	P	C
3	1	0	4

COURSE OUTCOMES:

At the end of the Course, the student will be able to:

1. Understand and analyzing different linear-time-invariant systems using transfer function.
2. Analyze system response in time domain for first and second order systems and evaluate static error.
3. Understand the concept of stability and its assessment for linear-time invariant systems.
4. Analyze system response in frequency domain and understanding compensation networks.
5. Realize the concept of state variable, state space and analyze the stability of linear Time discrete systems.

UNIT I:
Introduction to control Systems:
Concepts of control systems, open & closed loop control systems-examples, Industrial Control systems examples, Mathematical models of physical systems.
Transfer Function Representation: Block diagram representation of systems considering electrical systems as examples- Block diagram algebra – Representation by signal flow graph-Reduction using Manson's gain formula

UNIT II:
Time Response Analysis: Standard test signals – Time response of first order systems-Characteristic Equation of feedback controls systems, Transient response of second order systems – Time domain specifications - Steady state response – Steady state errors & error constants – Effects of proportional derivative, proportional integral systems and PID controllers, Application of Proportional, Integral and Derivative Controllers.

UNIT III:
Stability analysis in S- Domain:
The concept of stability – Routh's stability criterion – qualitative stability & conditional stability – limitations of Routh's stability
Root Locus technique: The root locus concept – construction of root loci-effects of adding poles and zeros to G(s)H(s) on the root loci.

UNIT IV:

Frequency-response analysis:

Relationship between time and frequency response, Polar plots, Bode plots, Nyquist stability criterion. Relative stability using Nyquist criterion – gain and phase margin. Closed-loop frequency response, Introduction to compensation techniques

UNIT V:

State space analysis:

Concepts of state, state variables and state model, derivation of state models from block diagrams, Diagonalization-Solving the Time invariant state Equation- State Transition Matrix and it's Properties-Concepts of Controllability and Observability.

TEXT BOOKS:

1. Nagoor kani A, Control Systems Engineering, CBS PUB & DIST,2020
2. Nagrath I J & Gopal M, Control Systems Engineering, New Age International, 2009.

REFERENCE BOOKS:

1. A.Anand Kumar, Control Systems, PHI Publications, Second Edition,2014.
2. Jagan N.C, Control Systems, BS Publications, 2014.

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ANTENNA AND WAVE PROPAGATION

III B.Tech I semester **Course Code: A225416**

L	T	P	C
3	0	0	3

COURSE OUTCOMES:

At the end of the course the student should be able to

1. Understand different antennas, field analysis and their applications to antenna elements.
2. Distinguish the mechanism of radiation, different antenna characteristics, mathematical relations their estimates in practical cases.
3. Analyze and design the working of different antenna's and to interpret the radiation pattern of planar arrays from the knowledge of linear arrays.
4. Obtain the capability to differentiate and report the electromagnetic radiation levels in the Atmosphere and any radio transmissions.
5. Design Microwave antenna Systems from specification

UNIT I:

Antenna Basics:

Basic Antenna Parameters – Patterns, Beam Area, Radiation Intensity, Beam Efficiency, Directivity-Gain-Resolution, Antenna Apertures, Effective Height.Fields from Oscillating Dipole, Field Zones, Front - to-back Ratio, Antenna Theorems, Radiation, Retarded Potentials – Helmholtz Theorem.

Thin Linear Wire Antennas:

Radiation from Small Electric Dipole, Quarter Wave Monopole and Half Wave Dipole – Current Distributions, Field Components, Radiated Power, Radiation Resistance, Beam Width, Directivity, Effective Area and Effective Height, Natural Current Distributions, Far Fields and Patterns of Thin Linear Centre-fed Antennas of Different Lengths. Loop Antennas - Small Loop, Comparison of Far Fields of Small Loop and Short Dipole, Radiation Resistances and Directivities of Small Loops (Qualitative Treatment).

UNIT II:

Antenna Arrays:

Point Sources – Definition, Patterns, arrays of 2 Isotropic Sources - Different Cases, Principle of Pattern Multiplication, Uniform Linear Arrays – Broadside Arrays, End fire Arrays.

Antenna Measurements:

Introduction, Concepts - Reciprocity, Near and Far Fields, Coordinate System, Sources of Errors. Patterns to be Measured, Directivity Measurement, Gain Measurements (by Comparison, Absolute and 3-Antenna Methods).

UNIT III:

VHF, UHF and Microwave Antennas - I:

Arrays with Parasitic Elements, Yagi-Uda Array, Folded Dipoles and their Characteristics, Helical Antennas – Helical Geometry, Helix Modes, Horn Antennas – Types, Fermat's Principle, Optimum Horns.

VHF, UHF and Microwave Antennas – II:

Microstrip Antennas – Introduction, Features, Advantages and Limitations, Rectangular Patch Antennas – Geometry and Parameters, Characteristics of Microstrip Antennas. Reflector Antennas – Introduction, Flat Sheet and Corner Reflectors, Paraboloidal Reflectors – Geometry, Pattern Characteristics, Feed Methods, Reflector Types – Related Features.

UNIT IV:

Wave Propagation:

Definitions, Categorizations and General Classifications, Different Modes of Wave Propagation, Ray/Mode Concepts.

Ground Wave Propagation:

Plane Earth Reflections, Space and Surface Waves, Wave Tilt, Curved Earth Reflections.

Space Wave Propagation:

Field Strength Variation with Distance and Height, Effect of Earth's Curvature, Absorption, Super Refraction, M-Curves and Duct Propagation, Scattering Phenomena, Troposphere Propagation.

UNIT V:

Sky Wave Propagation:

Structure of Ionosphere, Refraction and Reflection of Sky Waves by Ionosphere, Ray Path, Critical Frequency, MUF, LUF, OF, Virtual Height and Skip Distance, Relation between MUF and Skip Distance, Multi-hop Propagation.

TEXT BOOKS:

1. Kraus J D, Marhefka R J and Ahmad S. Khan , Antennas and Wave Propagation, Tata McGraw-Hill, 2010.
2. Jordan E C and Balmain K G, Electromagnetic Waves and Radiating Systems,Prentice Hall India, 2000.

REFERENCE BOOKS:

1. Balanis C A, Antenna Theory, John Wiley, 2005.
2. K.D. Prasad & Satya Prakashan, Antennas and Wave Propagation, Tech India Publications, 2001.

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COMPUTER ORGANIZATION & OPERATING SYSTEMS
(Professional Elective–I)

III B.Tech. I Semester **Course Code: A225417**

L	T	P	C
3	0	0	3

Course Outcomes:
After completion of this course the student will able to

1. Visualize the organization of different blocks in a computer.
2. Utilize the micro-level operations to control different units in a computer.
3. Understand the memory system and different ways of communicating with IO devices and standard IO interfaces.
4. Understand the design of memory unit, learn the overview of operating system.
5. Learn about major activities of an OS with regard to file management and the operating system functions.

UNIT-I
Basic Structure of Computers: Computer Types, Functional Units, Basic Operation Concepts, Bus Structures, Software, Performance, Multiprocessors and Multi Computers, Data Representation, Fixed Point Representation, Floating Point Representation.

Register Transfer Language and Micro Operations: Register Transfer Language, Register Transfer, Bus and Memory Transfer, Arithmetic Micro Operations, Logic Micro Operations, Shift Micro Operations, Arithmetic Logic Shift Unit.

UNIT-II:
Basic Computer Organization and Design:
Instruction Codes, Computer Registers, Computer Instructions, Instruction Cycle, Timing and Control, Memory Reference Instructions, Input, Output and Interrupt.
Central Processing Unit:
Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer (RISC).

UNIT-III:
The Memory System: Basic Concepts, Semiconductor RAM, Types Of Read Only Memory (ROM), Cache Memory, Performance Considerations, Secondary Storage RAID, Direct Memory Access (DMA).
Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer Modes, Priority Interrupt, Input-Output Processor (IOP), Introduction to Peripheral Components, Interconnect (PCI) Bus, Introduction to Standard Serial Communication Protocols like RS232, USB, IEEE1394.

UNIT - IV:

Operating Systems Overview: Overview of Computer Operating Systems- Functions, Protection and Security, Distributed Systems, Special Purpose Systems, Operating Systems Structures Operating System Services and Systems Calls, System Programs, Operating System Generation.

Memory Management: Swapping, Contiguous Memory Allocation, Paging, Structure of Paging Table, Segmentation, Virtual Memory, Demand Paging, Page-Replacement Algorithms, Allocation of Frames, Deadlock characterization.

UNIT - V:

File System Interface: The Concept of a File, Access Methods, Directory Structure, File System Mounting, File Sharing, Protection.

File System Implementation: File System Structure, File system Implementation, Directory Implementation, Allocation Methods, Free-Space Management.

TEXT BOOKS:

1. Carl Hamacher, ZvonksVranesic, SafeaZaky - Computer Organization, 5th Edition, McGraw Hill.
2. M. Moris Mano -Computer Systems Architecture, 3rd Edition, Pearson
3. Abraham Silberchatz, Peter B. Galvin, Greg Gagne -Operating System Concepts, 8th Edition, John Wiley.

REFERENCE BOOKS:

1. William Stallings- Computer Organization and Architecture , 6thEdition, Pearson
2. Stallings - Operating Systems – Internals and Design Principles, 6thEdition, Pearson Education, 2009.
3. Principles of Operating Systems, B.L. Stuart, Cengage Learning, India Edition.

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DATA COMMUNICATIONS AND COMPUTER NETWORKS
(Professional Elective–I)

III B.Tech. I Semester **Course Code: A225418**

L	T	P	C
3	0	0	3

Course Outcomes: Upon completing this course, the student will be able to

1. Know the Categories and functions of various Data communication Networks
2. Design and analyze various error detection techniques.
3. Demonstrate the mechanism of routing the data in network layer
4. Know the significance of various Flow control and Congestion control Mechanisms
5. Know the Functioning of various Application layer Protocols.

UNIT – I: INTRODUCTION TO DATA COMMUNICATIONS:

Components, Data Representation, Data Flow, Networks- Distributed Processing, Network Criteria, Physical Structures, Network Models, Categories of Networks Interconnection of Networks, The Internet - A Brief History, The Internet Today, Protocol and Standards - Protocols, Standards, Standards Organizations, Internet Standards. Network Models, Layered Tasks, OSI model, Layers in OSI model, TCP/IP Protocol Suite.

UNIT – II: DATA LINK LAYER:

Links, Access Networks, and LANs- Introduction to the Link Layer, The Services Provided by the Link Layer, Types of errors, Redundancy, Detection vs Correction, Forward error correction Versus Retransmission Error-Detection and Correction Techniques, Parity Checks, Check summing Methods, Cyclic Redundancy Check (CRC), Framing, Flow Control and Error Control protocols , HDLC, Multiple Access Protocols, Random Access, ALOHA, Controlled access, MAC Protocol.

UNIT – III: THE NETWORK LAYER:

Introduction, Forwarding and Routing, Network Service Models, Virtual Circuit and Datagram Networks-Virtual-Circuit Networks, Datagram Networks, Origins of VC and Datagram Networks, Inside a Router-Input Processing, Switching, Output Processing, Queuing, The Routing Control Plane, The Internet Protocol (IP): Forwarding and Addressing in the Internet-Datagram format, Ipv4 Addressing, Internet Control Message Protocol (ICMP), IPv6

UNIT – IV: TRANSPORT LAYER:

Introduction and Transport Layer Services : Relationship Between Transport and Network Layers, Overview of the Transport Layer in the Internet, Multiplexing and Demultiplexing, Connectionless Transport: UDP -UDP Segment Structure, UDP Checksum, Principles of Reliable Data Transfer-Building a Reliable Data Transfer Protocol, Pipelined Reliable Data Transfer Protocols, Go-Back-N(GBN), Selective Repeat(SR), Connection Oriented Transport: TCP - The TCP Connection, TCP Segment Structure, Congestion Control.

UNIT – V: APPLICATION LAYER:

Principles of Networking Applications – Network Application Architectures, Processes Communicating, Transport Services Available to Applications, Transport Services Provided by the File Transfer: FTP - FTP Commands and Replies, Electronic Mail in the Internet- STMP, Comparison with HTTP, DNS-The Internet's Directory Service – Service Provided by DNS, Overview of How DNS Works, DNS Records and messages.

TEXTBOOKS:

1. Kurose James F, Keith W- Computer Networking A Top-Down Approach,6th Edition, Pearson.
2. Behrouz A. Forouzan - Data Communications and Networking, 4th Edition, McGraw-Hill Education

REFERENCES:

1. Bhusan Trivedi - Data communication and Networks, Oxford university press, 2016
2. Andrew S Tanenbaum - Computer Networks,4th Edition, Pearson Education
3. W. A. Shay - Understanding Communications and Networks, 3rd Edition, Cengage Learning.

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INFORMATION THEORY AND CODING
(Professional Elective-I)

III B.Tech. I Semester **Course Code: A225419**

L	T	P	C
3	0	0	3

COURSE OUTCOMES:
At the end of the course, students will be able to:

1. Understand the concept of information theory, coding techniques and errors related to it.
2. Compare the different coding techniques.
3. Formulate codes using different coding techniques
4. Apply different coding techniques to develop an error free communication system.
5. Inspect error detection and correction in various coding technique.

UNIT-I:
Basics of Information Theory:
Entropy, Entropy for discrete ensembles, Information rate, source coding: Shannon's noiseless coding theorem, Shannon's noisy coding theorem, Mutual Information, Shannon- Hartley law

UNIT-II:
Source Coding:
Encoding of the Source Output, Shannon's Encoding Algorithm. Shannon Fano Encoding Algorithm, Huffman codes, Extended Huffman coding, Arithmetic Coding, Lempel – Ziv Algorithm, Calculations of Channel capacity and bounds for Discrete Channel, Applications to continuous channels

UNIT-III:
Information Channels:
Communication Channels, Channel Models, Channel Matrix, Joint probability Matrix, Binary Symmetric Channel, System Entropies, Mutual Information, Channel Capacity, Channel Capacity of : Binary Symmetric Channel, Binary Erasure Channel, Morgan's Theorem, Continuous Channels

UNIT-IV:
Error Control Coding:
Examples of Error control coding, methods of Controlling Errors, Types of Errors, Linear Block Codes: matrix description of Linear Block Codes, Error Detection and Error Correction Capabilities of Linear Block Codes, Single Error Correcting hamming Codes, Binary Cyclic Codes: Algebraic Structure of Cyclic Codes, Encoding using an (n-k) Bit Shift register, Syndrome Calculation, Error Detection and Correction

UNIT-V:

Convolution Arithmetic Codes:

Convolution Encoder, Time domain approach, Transform domain approach, Code Tree, Trellis and State Diagram, Viterbi Algorithm

TEXT BOOKS:

1. Abramson N, Information and Coding, McGraw Hill, 1963.
2. Mansurpur M, Introduction to Information Theory, McGraw Hill, 1987.

REFERENCE BOOKS:

1. Ash R B, Information Theory, Prentice Hall, 1970.
2. Chitode J S, Information Theory and coding, Technical publication, 2009.

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INTRODUCTION TO MICROCONTROLLERS

(Open Elective – 1)

III B.Tech I SEMESTER **Course Code: A225420**

L	T	P	C
3	0	0	3

COURSE OUTCOMES:

At the end of the course the student should be able to

1. Interpret the internal organization of 8051 with its unique features.
2. Understand the basic concept of various addressing modes, instruction set and simple Assembly programs
3. Provide Knowledge about special function registers in 8051.
4. Understand the fundamental concept of interfacing.
5. Study the basic concepts of Advanced ARM processors

UNIT-I:

8051 Microcontrollers:

Introduction-Microprocessors & microcontrollers- Comparison - RISC, CISC, Harvard and Von Neumann architectures-Architecture- Pin Description – I/O Ports- PC, DPTR, PSW register, Memory organization

UNIT-II:

8051 Addressing modes: Introduction – addressing modes in 8051 – Immediate, Register, Direct, Register indirect, indexed and implied addressing modes.

Basic assembly language programming concepts: Assembly language program format-Instruction set of 8051- Simple programs.

UNIT-III:

Special Function Registers: Timer and Counters in 8051 – Modes of operation – TCON, TMOD, - Serial communication in 8051 – SCON, SBUF, PCON registers, Interrupt in 8051, Interrupt enable register, Interrupt priority registers - Simple programs.

UNIT-IV:

Interfacing the 8051: Interfacing LCD, Matrix keyboard, 7 Segment display, Analog to Digital Converter, Digital to analog converter, Stepper motor with 8051

UNIT-V:

ARM Architecture: Introduction to ARM-Features of ARM-ARM Processor family-ARM Processor categories- Application of ARM-ARM Architecture – Register & Special registers-PSR, APSR, IPSR, EPSR, PRIMASK and control register- ARM instruction set.

TEXT BOOKS:

1. The 8051 Microcontroller, Kenneth. J. Ayala, Cengage Learning, 3rd Ed, 2004.
2. Raj Kamal , Microcontrollers Architecture, Programming, Interfacing and System Design,Pearson, 2005.

REFERENCE BOOKS:

1. Mazidi and Mazidi, The 8051 Microcontroller and Embedded Systems, Prentice Hall India, 2000.
2. ARM System Developers guide, Andrew N SLOSS, Dominic SYMES, Chris WRIGHT, Elsevier,2012

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ELECTRONIC MEASURING INSTRUMENTS
(Open Elective–I)

III B.Tech I Semester **Course Code: A225421**

L	T	P	C
3	0	0	3

COURSE OUTCOMES:
At the end of the course the student should be able to

1. Acquire knowledge in Characteristics of Instruments, measurement of electrical quantities
2. Measure and analyze the signals using CRO.
3. Study the performance electronic systems using signal generators and wave analyzers
4. Acquire knowledge on Transducers and understanding their applications in real time world
5. Understanding the acquisition and storing data of non-electrical and electrical quantities

UNIT-I: Measurements and measuring systems:
Functional Diagram of Instrumentation System, Static characteristics: Accuracy - Precision – Resolution – Sensitivity – measurement Errors, Dynamic Characteristics: Speed of response – fidelity – Lag - Dynamic error - Statistical Analysis, Basic meter movement, DC Ammeters: Multi-range, DC voltmeters: Multi-range, AC voltmeters: Rectifier type - Thermocouple Type, Ohmmeters: Series type and Shunt type, Multimeter

UNIT-II: Oscilloscopes:
Oscilloscope block diagram, Cathode Ray Tube, Vertical Deflection System, Horizontal Deflection System, Dual Beam CRO, Dual Trace CRO, Measurements with CRO: Amplitude – Time period - Frequency – Phase, Lissajous patterns, Sampling Oscilloscope, Analog Storage Oscilloscope, Digital Storage Oscilloscope.

UNIT-III: Signal Generators and Signal analyzers:
Signal Generators:
Function generator, RF signal generators, Sweep frequency generator.
Signal analyzers:
Wave analyzers: Frequency Selective Wave Analyzer - Heterodyne Wave Analyzer, Total Harmonic Distortion Analyzer, Spectrum Analyzer.

UNIT-IV: Transducers:
Classification of Transducers, Strain gauges, Capacitive Transducers, Linear Variable Differential Transducer (LVDT), Piezoelectric Transducer, Thermocouple, Thermistor, Measurement of Displacement, Velocity, Acceleration, Vibration, Force, Pressure, Fluid Flow, Liquid Level and Temperature.

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UNIT-V: Bridges and Recorders:

Bridges:

Wheat Stone Bridge, Kelvin Bridge, Maxwell Bride, Schering Bridge and Wien Bridge

Recorders:

Magnetic disk and tape Recorders, LED, LCD, Dot matrix display, Strip Chart Recorder, X-Y Recorder

TEXT BOOKS:

1. Albert D. Helfrick, Cooper William D, Modern Electronic Instrumentation and Measurement Techniques, Prentice-Hall of India, 1997.
2. Kalsi H S, Electronic instrumentation, Tata Mcgraw Hill, 2015.

REFERENCE BOOKS:

1. David A. Bell, Electronic Instrumentation & Measurements, Prentice-Hall, 2003.
2. Sawhney A K, PuneetSawhney , A Course in Electrical and Electronic Measurements and Instrumentation, Dhanpat Rai & Company, 2016

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DIGITAL ELECTRONICS FOR ENGINEERING
(Open Elective–I)

III B.Tech I Semester **Course Code: A225422**

L	T	P	C
3	0	0	3

COURSE OUTCOMES:

At the end of the course the student should be able to

1. Demonstrate the basic theorems of Boolean algebra, logic gates, combinational and sequential circuits and memories.
2. Analyze the combinational and sequential circuits and memories.
3. Design of logic circuits
4. Understanding the concepts of sequential circuits
5. Demonstrate the basic counter circuits

UNIT-I:

Number System and minimization techniques:

Number System:

Review of number system and base conversion, complements, signed binary numbers, Floating point number representation, Error detection &Correction(Hamming Code), Boolean Algebra**,** postulates

UNIT-II:

Minimization techniques

Basic logic gates, Canonical and Standard Form, Minimization of switching function using theorem, The Karnaugh Map Method-Up to Four Variable Maps.

UNIT-III:

Combinational Circuits:

Adders & Subtractor, Binary Adder-Subtractor, Decimal Adder, Binary Multiplier, Magnitude Comparators, Multiplexers, De-multiplexers, Decoders, Encoders Hazards and Hazard Free Relations.

UNIT-IV:

Sequential circuits-I:

Basic Architectural Distinctions between Combinational and Sequential circuits, Latches, Flip Flops: SR, JK, Race Around Condition in JK, JK Master Slave, D and T Type Flip Flops, Excitation Table of all Flip Flops, Design of a Clocked Flip-Flop, Timing and Triggering Consideration, Clock Skew, Conversion from one type of Flip-Flop to another.

Unit-V:

Sequential Circuits-II:

Synchronous – Asynchronous – Comparison, Design of Single mode Counter, Ripple Counter, Ring Counter, Shift Register, Shift Register Sequences, Ring Counter Using Shift Register, MOD Counters

TEXT BOOKS:

1. Morris Mano , Digital Design, Prentice Hall India, 2006
2. A Anand Kumar, Switching Theory and Logic Design, Prentice Hall India, 2013

REFERENCE BOOKS:

1. Jain N P, Modern Digital Electronics, Tata McGraw Hill, 2007.
2. Fredriac J. Hill, Gerald R. Peterson, Introduction to Switching Theory and Logic Design Wiley, 1981

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MICRO PROCESSORS AND MICRO CONTROLLERS LABORATORY

III B.Tech I Semester **Course Code: A225488**

L	T	P	C
0	0	2	1

COURSE OUTCOMES:

After going through this course the student will be able to:

1. Apply the fundamentals of assembly level programming of microprocessors and microcontrollers.
2. Build a program on a microprocessor using instruction set of 8086 and 8051.
3. Evaluate Assembly language program for 8086 and 8051 microcontroller to interface peripheral devices for simple applications
4. Develop assembly language programs for various applications using 8051 microcontroller
5. Understand the development of prototype using combination of hardware and software

Note: Minimum 12 Experiments have to be conducted

1. Introduction to MASM.
2. Programs for 16 bit Arithmetic Operations for 8086.
3. Program for sorting an array for 8086.
4. Program for searching a number or character in a string for 8086.
5. Programs for String Manipulations for 8086.
6. Interfacing to 8086 and programming to control Stepper Motor.
7. Interfacing ADC to 8086.
8. Interfacing DAC to 8086.
9. Serial Communication between Two Microprocessors using 8255.
10. Programming using Arithmetic, Logical and Bit Manipulation Instructions of 8051.
11. Program and verify timer/counter in 8051
12. Program and verify interrupt handling in 8051
13. UART operation in 8051
14. Interfacing LCD to 8051.
15. Data transfer from peripheral to memory through DMA Controller 8237/8257

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ADVANCED ENGLISH COMMUNICATION SKILLS LABORATORY

III B.Tech. I Semester **Course Code: A225087**

L	T	P	C
0	0	2	1

COURSE OUTCOMES:

At the end of the course a student is expected to:

1. Enhance reading and active listening techniques for a faster and better comprehension.
2. Exhibit strong writing skills to exhibit ideas effectively in social and professional situations.
3. Demonstrate effective presentation skills.
4. Develop critical thinking, problem-solving, decision-making and communication skills.
5. Display confidence during job interviews.

SYLLABUS:

1. **Activities on Listening and Reading Comprehension:** Active Listening – Development of Listening Skills Through Audio clips - Benefits of Reading– Methods and Techniques of Reading – Basic Steps to Effective Reading – Common Obstacles – Discourse Markers or Linkers - Sub- skills of reading –Reading for facts, negative facts and Specific Details- Guessing Meanings from Context, Inferring Meaning-Critical Reading—Reading Comprehension–Exercises for Practice.

2. **Activities on Writing Skills: Vocabulary for Competitive Examinations** – Planning for Writing – Improving Writing Skills-Structure and presentation of different types of writing– Free Writing and Structured Writing- Letter Writing –Writing a Letter of Application –Resume vs. Curriculum Vitae–Writing a Résumé–Styles of Résumé-e- Correspondence–Emails–Blog Writing- (N)etiquette– Report Writing – Importance of Reports – Types and Formats of Reports– Technical Report Writing– Exercises for Practice.

3. **Activities on Presentation Skills - Starting a conversation** – responding appropriately and relevantly – using the right language and body language–Role Play in different situations including Seeking Clarification, Making a Request, Asking for and Refusing Permission, Participating in a Small Talk–Oral presentations (individual land group) through JAM sessions-PPTs–Importance of Presentation Skills– Planning, Preparing, Rehearsing and Making a Presentation – Dealing with Glossophobia or Stage Fear – Understanding Nuances of Delivery - Presentations through Posters/Projects/Reports – Checklist for Making a Presentation and Rubrics of Evaluation.

4. **Activities on Group Discussion (GD):** Types of GD and GD as a part of a Selection Procedure- Dynamics of Group Discussion- Myths of GD - Intervention, Summarizing - Modulation of Voice, Body Language, Relevance, Fluency and Organization of Ideas– Do's and Don'ts-GD Strategies – Exercises for Practice.

5. **Interview Skills: Concept and Process** - Interview Preparation Techniques - Types of Interview Questions–Pre-interview Planning, Opening Strategies, Answering Strategies-Interview through Tele-conference & Video-conference - Mock Interviews.

Minimum Requirement:

The Advanced English Communication Skills (AECS) Laboratory shall have the following infrastructural facilities to accommodate at least 35 students in the lab:

- Spacious room with appropriate acoustics
- Round Tables with movable chairs
- Audio-visual aids
- LCD Projector
- Public Address system
- One PC with latest configuration for the teacher
- T.V, a digital stereo & Camcorder
- Headphones of High quality

Suggested Software:

1. TOEFL&GRE (BARRONS, USA, Cracking GRE by CLIFFS)
2. Oxford Advanced Learner's Dictionary,10 Edition
3. Cambridge Advanced Learner's Dictionary

Text books:

1. Rizvi, M. Ashraf (2018). Effective Technical Communication. (2ed.).McGraw Hill Education (India) Pvt. Ltd.
2. Bailey, Stephen. (2018). Academic Writing: A Handbook for International Students. (5 Edition). Routledge.

References Books:

1. Raman, Meenakshi & Sharma, Sangeeta. (2022).Technical Communication, Principles and Practice. (4th Edition) Oxford University Press.
2. Anderson, Paul V (2007).Technical Communication. Cengage Learning Pvt.Ltd. New Delhi.

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R22

ANTENNA LABORATORY

III B.Tech. I Semester **Course Code: A225489**

L	T	P	C
0	0	2	1

COURSE OUTCOMES:

At the end of the course the student should be able to

1. Illustrate the different ways of measuring antenna parameters.
2. Differentiate the different Radiation pattern of the antennas
3. Study the characteristics of Antennas
4. Articulate the performance of Antennas based on the measurements
5. Formulate an antenna design using Antenna technologies.

LIST OF THE EXPERIMENTS: (Perform any 10 experiments)

1. Measurement of parameters of Half wave Dipole Antenna
2. Measurement of parameters of monopole Antenna
3. Measurement of parameters of large loop Antennas
4. Measurement of parameters of small loop Antennas
5. Measurement of parameters of Helical Antenna
6. Measurement of parameters of 2- element Antenna Array
7. Measurement of parameters of Yagi-Uda Antenna
8. Measurement of parameters of Folded Dipole Antenna
9. Performance analysis of N-element linear array
10. Design and simulation of Crossed Yagi Antenna
11. Study of performance of 2x2 Helical Antenna Array
12. Design and analysis Planar reflector antenna
13. Design and study of 3x3 dipole Antenna Array

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ENVIRONMENTAL SCIENCE

III B.Tech. I Semester **Course Code: A225016**

L	T	P	C
2	0	0	0

COURSE OUTCOMES

Students will be able to:

- Define and explain the structure and functions of ecosystem, value of biodiversity, threats and conservation of biodiversity.
- Explain the limitations of the resources and impacts of over utilization of all natural resources.
- Explain the sources and effects of environmental pollutions and list the available techniques to control the pollution.
- Explain the global environmental issues like climate change, ozone hole and can explain the scope of EIA, Environmental Management Plan, environmental audit and list the EIA methods.
- Mention the salient features of environmental acts and rules, define the sustainable goals along with measures required for the sustainability.

UNIT I:

Ecosystem: Definition, Scope and Importance of ecosystem, Structure and Functions of ecosystem: Food chains, Food Web and Ecological Pyramids, Flow of energy; Bio-magnification.

Biodiversity and Biotic Resources: Introduction, Definition, levels of Biodiversity, Value of biodiversity, Hot spots of biodiversity, Threats to biodiversity, conservation of biodiversity: In-Situ and Ex-situ conservation.

UNIT II:

Natural Resources: Classification of Resources, **Water resources**: use and over utilization of surface and ground water, Dams: benefits and problems, Rain water harvesting; **Energy resources**: growing energy needs, Renewable and Non Renewable Energy resources. **Land resources**: land degradation – Landslide and Soil Erosion; **Forest Resources –** Uses and Exploitation.

UNIT III:

Environmental Pollution And Control: Types of Pollution, Sources, Effects and Control measures of Air Pollution, Water Pollution, Soil Pollution and Noise Pollution.

UNIT IV:

Global Environmental Problems and Global Efforts: Greenhouse effect, Global Warming, climate change and their impacts on human environment; Ozone depletion and Ozone depleting substances (ODS); Aid Rains.

Environmental Impact Assessment (EIA): Scope of EIA and EIA methods, scope of Environmental audit and Environmental Management Plan.

UNIT V:

Environmental Policy, Legislation, Rules And Regulations: Salient features of Environmental Protection act, Air (Prevention and Control of pollution) Act- 1981, Water (Prevention and Control of pollution) Act-1974, Forest Conservation Act, Municipal solid waste, Hazardous waste, E-waste, Bio-medical waste, Radioactive waste Rules.

Towards Sustainable Future: Concept of Sustainable Development, Sustainable goals defined by UN, Threats to Sustainability, Environmental Education, Role of IT in Environment, Smart Cities, Concept of Green Building, Low Carbon Lifestyle, Life cycle assessment and Ecological Foot Print.

TEXT BOOKS:

1. Text Book of Environmental Studies by Anubha Kaushik (4th Edition), New age International Publishers.
2. Environmental studies by Erach Bharucha 2005, University Grants Commission, University Press.

REFERENCE BOOKS:

1. Textbook of Environmental Science and Technology by M. Anji Reddy, 2007.
2. Text Book of Environmental Studies by Anubha Kaushik (3rdEdition), New age International Publishers.
3. Environmental Science: Towards a Sustainable Future by Richard T. Wright, 2008 PHL Learning Private Ltd, New Delhi.

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DIGITAL SIGNAL PROCESSING

III B.Tech. II Semester **Course Code: A226423**

L	T	P	C
3	0	0	3

COURSE OUTCOMES:

At the end of the course the student should be able to

1. Define the concepts of Fourier transforms, digital filters with their effect of errors.
2. Illustrate speed and memory requirements of Fourier transforms on signals.
3. Relate the effects of finite word length on systems.
4. Formulate frequency filtering, impulse response filters with its structure.
5. Ability to understand various applications of DSP such as multi rate signal processing, telecommunication

UNIT-I:
Introduction to DSP- applications-advantages
Discrete Fourier Transform:
DTFT**,** DFT-Complexity calculation- Properties of DFT- linear convolution- Circular convolution- Sectioned convolution- Relation between DTFT, DFS, DFT and Z-Transform.

UNIT-II:
Fast Fourier Transform:
Fast Fourier Transform (FFT), Radix-2 decimation-in-time and decimation-in-frequency FFT Algorithms, Inverse FFT- Convolution of sequences using FFT

UNIT-III:
IIR Digital Filters:
Analog filter approximations –Butterworth and Chebyshev- Design of IIR digital filters from analog filters- Impulse invariant technique – warping effect- bilinear transformation method - Spectral transformations, realization of IIR filters- direct, canonic, cascade and parallel forms.

UNIT-IV:
FIR Digital Filters:
Characteristics of FIR Digital filters - frequency response – Gibbs Phenomenon- Design of FIR filters - window techniques – Frequency Sampling - Comparison of IIR and FIR filters, realization of FIR filters- direct& cascade forms

UNIT-V:
Finite Word Length Effects:
Quantization- Quantization error- Types- Limit cycles- Overflow oscillations –Scaling
Multirate Signal Processing: Introduction - down sampling- Decimation – up sampling – Interpolation -Sampling Rate Conversion

TEXT BOOK:

1. John G. Proakis, Digital Signal Processing, Principles, Algorithms, and Applications, Pearson, 2007.
2. Tarun Kumar Rawat , Digital Signal Processing, Oxford Publications, 2015

REFERENCES BOOKS:

1. Andreas Antoniou, Digital Signal Processing, TATA McGraw Hill , 2006
2. Ashok Ambardar , Digital Signal Processing, Cenage Learning, 2007.

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BUSINESS ECONOMICS AND FINANCIAL ANALYSIS

III B.Tech. II Semester **Course Code: A226018**

L	T	P	C
3	0	0	3

Course Outcomes:

At the end of the course the students are expected to

CO1: Understand the nature and scope of business economics.
CO2: Analyze the Demand, Supply Functions and to forecast the demand.
CO3: Understand the concept of production and its relationship with business operations**.**
CO4: Analyze the Financial Statements of a Company.
CO5: Compare and interpret the Financial Statements of a Company using ratios.

UNIT-I **Introduction to Business and Economics:** Types of Business Entities, Theory of Firm, Capital and Sources of Capital for a Company, Economics - Significance of Economics, Micro and Macro Economic Concepts, Concepts and Importance of National Income, Inflation, Types of Inflation, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist, Multidisciplinary nature of Business Economics.

UNIT-II **Demand and Supply Analysis:** Elasticity of Demand: Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demand in decision making, Demand Forecasting: Characteristics of Good Demand Forecasting, Steps in Demand Forecasting, Methods of Demand Forecasting. Supply Analysis: Determinants of Supply, Supply Function & Law of Supply.

UNIT-III **Production, Cost, Market Structures & Pricing:** Production Analysis: Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale. Cost analysis: Types of Costs. Market Structures: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, and Monopolistic Competition. Pricing: Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, and Cost Volume Profit Analysis.

UNIT-IV **Financial Accounting:** Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, and Preparation of Final Accounts.

UNIT-V **Financial Analysis through Ratios:** Concept of Ratio Analysis, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios (simple problems).

Text Books:

1. D. D. Chaturvedi, S. L. Gupta, Business Economics - Theory and Applications, International Book House Pvt. Ltd. 2013.
2. Dhanesh K Khatri, Financial Accounting, Tata McGraw Hill, 2011.
3. GeethikaGhosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata Mc Graw Hill Education Pvt. Ltd. 2012.

Reference Books:

1. Paresh Shah, Financial Accounting for Management 2e, Oxford Press, 2015.
2. S. N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting,5e, Vikas Publications, 2013.

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CMOS VLSI DEISGN

III B.Tech. II Semester **Course Code: A226424**

L	T	P	C
3	0	0	3

COURSE OUTCOMES:

At the end of the course the student should be able to

1. Enumerate different steps involved in Integrated Circuits technology for MOS transistor and explain the primary and secondary effects of MOSFET and BICMOS.
2. Summarize the fabrication process involved in VLSI circuits
3. Outline the design process involved in VLSI design flow for design of MOS transistors.
4. Understand and apply the concepts of memories in design.
5. Design digital circuits using Verilog HDL.

UNIT-I:
Introduction:
Introduction to IC Technology, Fabrication process of NMOS, PMOS CMOS and BiCMOS
Basic Electrical Properties:
Ids - Vds relationships, MOS transistor Threshold Voltage-Vt, Transconductance-gm, gds, figure of merit-ω0, Pass transistor, NMOS Inverter, Various pull ups, Ratioed Circuits CMOS Inverter analysis and design, Bi-CMOS Inverters.

UNIT-II:
VLSI Circuit Design Processes:
VLSI Design flow, MOS Layers - Stick Diagrams - Lambda(λ)-based Design rules - wires – Contacts – Transistors- Layout Diagrams – NMOS – PMOS - CMOS Inverters – Gates - Scaling of MOS circuits.

UNIT-III:
Gate Level Design:
Logic Gates – Pass transistors, Transmission gate- Switch logic - Alternate gate circuits, Latches- Time delays - Driving large capacitive loads - Wiring capacitance, Fan — in, Fan — out, Choice of layers.
Programmable Logic Devices:
PROM – PLA - PAL-Design Approach - CPLDs – FPGA -Parameters influencing low power design.

UNIT-IV:

Introduction to Verilog HDL:

Overview of Digital Design with Verilog HDL, typical HDL-flow, Concurrency, Simulation and Synthesis, Functional verification;

Gate Level Modeling:

Introduction, Modeling using basic Verilog gate primitives, description of AND, OR, NOT type gates, Design of Flip – Flops with Gate Primitives, Delays

UNIT-V:

Dataflow Modeling:

Continuous assignments, delay specification, expressions, operators, operands, operator types;

Behavioral Modeling:

Structured procedures, initial and always, blocking and non-blocking statements, The Case Statement, for Loop, While Loop, Design of Flip flop, Shift register

TEXT BOOKS:

1. Kamran Eshraghian, Douglas A. Pucknell, SholehEshraghian, Essentials of VLSI Circuits and Systems, Prentice, 2005.
2. T.R. Padmanabhan, Digital Design Through Verilog HDL, Wiley, 2003.

REFERENCE BOOKS:

1. John P. Uyemura, CMOS logic circuit Design, Springer, 1999.
2. Lal Kishore K, Prabhakar V S V, VLSI Design, I.K International, 2010.

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DIGITAL IMAGE PROCESSING
(Professional Elective-II)

III B.Tech. II Semester **Course Code: A226425**

L	T	P	C
3	0	0	3

COURSE OUTCOMES:

At the end of the course the student should be able to

1. State the Digital Image Fundamentals and operation associated with various stages of image processing.
2. Illustrate the mathematics involved in various stages of image processing.
3. Demonstrate the operations various stages of image processing.
4. Contrast the different types of operation and its impact on images.
5. Understand the anatomy of image compression in Image Transmission

UNIT-I:
Fundamentals of Image Processing:
Elements of Digital Image Processing Systems – Image sensing and Acquisition- Elements of Visual Perception – structure of human eye – light- luminance- brightness and contrast- image formation- Basic steps of image processing- Sampling -Quantization and Digital Image representation - Basic relationships between pixels – neighborhood, adjacency, connectivity, distance measures..

UNIT-II:
Image Enhancement in Spatial & frequency domain:
Image Enhancement in Spatial domain:
Introduction-Point Processing-Histogram processing- Arithmetic and logical operations-Fundamentals of Spatial filtering-masking-Spatial filters for Smoothing - Spatial filters for Sharpening.
Image Enhancement in Frequency domain:
Need for transform-Basics of filtering in frequency domain-Image smoothing in frequency domain-Image sharpening in frequency domain

UNIT-III:
Image Restoration:
Introduction- Degradation model –Noise models-Spatial domain filtering for restoration- Mean Filters – Order Statistics filters – Adaptive filters –frequency domain filtering for noise removal - Band reject Filters – Band pass Filters – Notch Filters –Degradation function estimation– Inverse filtering – Wiener filter.

UNIT-IV:

Image Segmentation and Morphological processing:

Image Segmentation:

Segmentation concepts - Point - Line - Edge Detection-Thresholding based segmentation- Local-Global and Adaptive Thresholding- Region based segmentation-Region growing-Region splitting and merging.

Morphological processing:

Introduction- structuring element – erosion – dilation – Opening - closing.

UNIT-V:

Image Compression:

Introduction-Redundancy in images-Fidelity Criteria-Image compression model-Lossless compression-Huffman coding -Lossless Predictive coding- Lossy compression– lossy predictive coding- Transform coding –Image compression standards- JPEG and JPEG 2000.

TEXT BOOKS:

1. Rafael C. Gonzales, Richard E. Woods, Digital Image Processing, Pearson, 2007.
2. Anil K. Jain, Fundamentals of Digital Image Processing, Pearson, 2005.

REFERENCE BOOKS:

1. Rafael C. Gonzalez, Richard E.. Woods, Richard Eugene Woods, Steven L. Eddins, Digital Image processing using MATLAB, Tata McGraw Hill, 2010.
2. William K Pratt, Digital Image Processing, John Wiley & Sons, 2002.

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MOBILE COMMUNICATIONS AND NETWORKS
(Professional Elective-II)

III B.Tech. II Semester **Course Code: A226426**

L	T	P	C
3	0	0	3

Course Outcomes: Upon completing this course, the student will be able to:

1. Known the evolution of cellular and mobile communication system.
2. Explore the Co-Channel and Non-Co-Channel interferences.
3. Known how to overcome the different fading effects?
4. Familiar with cell coverage for signal and traffic, diversity, techniques, frequency management, Channel assignment and types of handoff.
5. Demonstrate the difference between cellular and Adhoc Networks and design goals of MAC Layer protocol.

UNIT - I

Introduction to Cellular Mobile Radio Systems: Limitations of Conventional Mobile Telephone Systems. Basic Cellular Mobile System, First, Second, Third and Fourth Generation Cellular Wireless Systems. Uniqueness of Mobile Radio Environment-Fading-Tie Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time.

Fundamentals of Cellular Radio System Design: Concept of Frequency Reuse, Co-Channel Interference, Co-Channel Interference Reduction Factor, Desired C/I from a Normal Case in a Omni Directional Antenna System, System Capacity Improving Coverage and Capacity in Cellular Systems-Cell Splitting, Sectoring, Microcell Zone Concept.

UNIT – II

Co-Channel Interference: Measurement of Real Time Co-Channel Interference, Design of Antenna System, Antenna Parameters and their effects, diversity techniques-space diversity, polarization diversity, frequency diversity, time diversity.

Non Co-Channel Interference: Adjacent Channel Interference, Near end far end interference, cross talk, effects on coverage and interference by power decrease, antenna height decrease, effects of cell site components.

UNIT – III

Cell Coverage for Signal and Traffic: Signal Reflections in flat and Hilly Terrain, effects of Human Made Structures, phase difference between direct and reflected paths, constant standard deviation, straight line path loss slope, general formula for mobile propagation over water and flat open area, near and long-distance propagation, path loss from a point to point prediction model in different conditions, merits of lee model.

Frequency Management and Channel Assignment: Numbering and Grouping, Setup Access and Paging Channels, Channel Assignments to Cell Sites and Mobile Units.

UNIT - IV

Handoffs and Dropped Calls: Handoff Initiation, types of Handoff, Delaying Handoff, advantages of Handoff, Power Difference Handoff, Forced Handoff, Mobile Assisted and Soft Handoff, Intersystem handoff, Introduction to Dropped Call Rates and their Evaluation.

UNIT - V

Ad Hoc Wireless Networks: Introduction, Cellular and Ad Hoc wireless Networks, Applications and Ad Hoc Wireless Networks, Issues in Ad Hoc Wireless Networks, Ad Hoc Wireless Internet, MAC Protocols for Ad Hoc Wireless, Introduction, issues in designing AMAC Protocol for Ad Hoc wireless Networks, Design Goals of AMAC protocol for Ad Hoc Wireless Networks, Classification of MAC Protocols.

TEXT BOOKS:

1. W.C.Y. Lee - Mobile Cellular Telecommunications, 2nd edition, Mc Graw Hill, 1989.
2. Theodore. S. Rapport - Wireless Communications, 2nd editon, Pearson Education, 2002.

REFERENCE BOOKS:

1. C. Siva ram Murthy and B.S. Manoj - Ad Hoc Wireless Networks: Architectures and Protocols, PHI, 2004.
2. Simon Haykin, Michael Moher - Modern Wireless Communications, Pearson Education, 2005.
3. Vijay Garg - Wireless Communications and Networking, Elsevier Publications, 2007.
4. Andrea Goldsmith -Wireless Communications-, Cambridge University Press, 2005.

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EMBEDDED SYSTEM DESIGN
(Professional Elective-II)

III B.Tech. II Semester **Course Code: A226427**

L	T	P	C
3	0	0	3

Course Outcomes:

At the end of the course the student should be able to

1. Expected to understand the selection procedure of Processors in the embedded domain.
2. Design Procedure for Embedded Firmware.
3. Expected to visualize the role of Real time Operating Systems in Embedded Systems
4. Expected to evaluate the Correlation between task synchronization and latency issues
5. To Enumerate the need for Task Communications in a Multiprocessor Environment

UNIT I:
Introduction to Embedded Systems:
Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

UNIT II:
Typical Embedded System:
Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

UNIT III:
Embedded Firmware:
Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

UNIT IV:
RTOS Based Embedded System Design:
Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

UNIT V:

Task Communication:

Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/Synchronization Issues, Task Synchronization Techniques, Device Drivers, How to Choose an RTOS.

TEXT BOOKS:

1. Shibu K V**,** Introduction to Embedded Systems, McGraw-Hill Education**,** 2009.
2. Lyla B. Das, Embedded Systems an Integrated Approach, Pearson Education, 2013.

REFERENCE BOOKS:

1. Raj Kamal , Embedded systems architecture, programming and design, McGraw-Hill Education**,** 2003
2. Frank Vahid, Tony Givargis , Embedded System Design A Unified Hardware/Software Introduction, John Wiley, 2003

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FUNDAMENTALS OF INTERNET OF THINGS
(Open Elective–II)

B.Tech. ECE III Year II Semester **Course Code: A226428**

L	T	P	C
3	0	0	3

Course Outcomes: Upon completing this course, the students will be able to

- Know basic protocols in sensor networks.
- Program and configure Arduino boards for various designs.
- Python programming and interfacing for Raspberry Pi.
- Design IoT applications in different domains.

UNIT – I Introduction to Internet of Things: Characteristics of IoT, Physical design of IoT, Functional blocks of IoT, Sensing, Actuation, Basics of Networking, Communication Protocols, Sensor Networks.

UNIT - II Machine-to-Machine Communications: Difference between IoT and M2M, Interoperability in IoT, Introduction to Arduino Programming, Integration of Sensors and Actuators with Arduino.

UNIT – III Introduction to Python programming: Introduction to Raspberry Pi, Interfacing Raspberry Pi with basic peripherals, Implementation of IoT with Raspberry Pi.

UNIT - IV Implementation of IoT with Raspberry Pi: Introduction to Software defined Network (SDN), SDN for IoT, Data Handling and Analytics.

UNIT - V Cloud Computing: Sensor-Cloud, Smart Cities and Smart Homes, Connected Vehicles, Smart Grid, Industrial IoT.

Case Study: Agriculture, Healthcare, Activity Monitoring

TEXT BOOKS:

1. "The Internet 'of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press)

2. “Make sensors”: Terokarvinen, kemo, karvinen and villeyvaltokari, 1st edition, maker media, 2014.

3. "Internet of Things: A Hands-on Approach", by Arshdeep Bahga and Vijay Madisetti

REFERENCE BOOKS:

1. Vijay Madisetti, Arshdeep Bahga, “Internet of Things: A Hands-On Approach”

2. WaltenegusDargie,ChristianPoellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice"

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ELECTRONICS FOR HEALTH CARE
(Open Elective–II)

III B.Tech. II Semester **Course**

Code: A226429

L	T	P	C
3	0	0	3

Course Outcomes: Upon completion of this course, the students will be able to

1. Know about health care data and its conversion to information and to knowledge.
2. Acquire knowledge on (Electronic Health Records) EHRs and their Implementation.
3. Understand the working of electronic devices used for the patient monitoring.
4. Know the concepts of Telemedicine and therapeutic devices used inside the human body
5. Understand the importance of Therapeutic devices

UNIT I:
Health care data, Information and Knowledge: Definitions and Concepts, Converting Data to Information to Knowledge, Clinical Data Warehouses, What makes Health Informatics Difficult, Why Health IT fails Sometimes, Terminology of Analytics, Challenges to Data Analytics, Research and application of analytics, Role of Informatics in analytics.

UNIT II:
Electronic Health Records: Introduction, Need for Electronic Health Records, Institute of Medicine's Vision for EHRs, Electronic Health Record Key Component, Electronic Prescribing, Electronic Health Record Adoption, Electronic Health Record Adoption and Meaningful use Challenges, Electronic Health Record Examples, Logical Steps to Selecting and Implementing an EHR

UNIT III:
Patient Monitoring Systems: System Concepts, Cardiac Monitor, Bedside Patient Monitoring Systems, Central Monitors, Measurement of Heart Rate, Measurement of Pulse Rate, Blood Pressure Measurement, Measurement of Temperature, Measurement of Respiration Rate, Catheterization Laboratory Instrumentation.

UNITIV:
Biomedical Telemetry and Telemedicine: Wireless Telemetry, Single Channel Telemetry Systems, Multi-channel Wireless Telemetry Systems, Multi-patient Telemetry, Implantable Telemetry Systems, Transmission of Analog Physiological Signals, Over Telephone, Telemedicine.

UNIT V:
Therapeutic devices: Need for Cardiac Pacemaker, Implantable Pacemakers, DC Defibrillator, and Electronics in the Anaesthetic Machine.

TEXT BOOKS:

1. Robret E. Hoyt MD FACP "Health Informatics" sixth edition 2007.
2. R. S. Kandpur "Biomedical Instrumentation Technology and Applications" second edition Tata McGraw-Hill.

REFERENCS:

1. Edward H. Shortlliffe, James J.Cimino "Biomedical Informatics, Computer applications in Health care and Biomedicine" third edition Springer.
2. G.V.R.K.Acharyulu, Bhimaraya Metri, L. Kalyan Viswanath REDDY "Health care and Hospital Management Contemporary Issues and Strategies"

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TELECOMMUNICATIONS FOR SOCIETY
(Open Elective–II)

III B.Tech. II Semester **Course Code: A226430**

L	T	P	C
3	0	0	3

Course Outcomes: Upon completion of this course, the students will be able to

1. Understand the concepts of simplex, half duplex, and full duplex of one-way and two-way circuits.
2. Get knowledge on subscriber loop design and VF repeaters of voice telephony.
3. Get brief overview of video transmission and its broadcasting standards in television transmission.
4. Know different of modes of television transmission**.**
5. Understand the concept of CATV.

UNIT I:

INTRODUCTORY TOPICS IN TELECOMMUNICATIONS:

End-Users, Nodes, and Connectivities, Telephone Numbering and Routing, Use Of Tandem Switches in a Local Area Connectivity, Introduction to the Busy Hour and Grade Of Service, Simplex, Half-Duplex, and Full Duplex, One-Way and Two-Way Circuits, Network Topologies, Variations in Traffic Flow, Quality Of Service,

UNIT II:

QUALITY OF SERVICE AND TELECOMMUNICATION IMPAIRMENTS:

Objective, Quality of Service: Voice, Data, and Image, Signal-to-Noise Ratio, Voice Transmission, Data Circuits, Video (Television), The Three Basic Impairments and How They Affect the End-User, Amplitude Distortion, Phase Distortion, Noise Level, Typical Levels, Echo and Singing.

UNIT III:

TRANSMISSION ASPECTS OF VOICE TELEPHONY:

Definition of the Voice Channel, Operation of the Telephone Subset, Subscriber Loop Design, Design of Local Area Wire-Pair Trunks (Junctions), VF Repeaters (Amplifiers).

UNIT IV:

TELEVISION TRANSMISSION:

Background and Objectives, An Appreciation of Video Transmission, Critical Video Parameters, Video Transmission Standards (Criteria for Broadcasters), Methods of Program Channel Transmission, The Transmission of Video Over LOS Microwave, TV Transmission by Satellite Relay, Digital Television, Conference Television, Brief Overview of Frame Transport for Video Conferencing.

UNIT V:

COMMUNITY ANTENNA TELEVISION (CABLE TELEVISION):

Objective and Scope, The Evolution of CATV, System Impairments and Performance Measures, Hybrid Fiber-Coax (HFC) Systems, Digital Transmission of CATV Signals, Two-Way CATV Systems, Two-Way Voice and Data over CATV Systems Based on the DOCSIS 2.0 Specification,.

TEXT BOOKS:

1. Roger L. Freeman "Fundamentals of Telecommunications" 2nd Edition, John Wiley & Sons Publications 2005.
2. Annabel Z. Dodd "The Essential Guide to Telecommunications" 5th Edition, Prentice Hall 2012.

REFERENCES:

1. JYRKI T. J. PENTTINEN "THE TELECOMMUNICATIONS HANDBOOK" John Wiley & Sons Publications 2015.
2. Prof. Dr. Muhammad EL-SABA "Telecommunications systems and data networks" 3rd Edition 2015.

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VLSI LABORATORY

III B.Tech. II Semester **Course Code: A226490**

L	T	P	C
0	0	2	1

COURSE OUTCOMES:

At the end of the course the student should be able

1. To learn Hardware Descriptive Language (Verilog).
2. To learn the fundamental principles of Digital System Design using HDL and FPGA.
3. To learn the fundamental principles of VLSI circuit design in digital domain
4. To analyze various combinational and sequential circuits using Verilog HDL
5. To provide hands on design experience with EDA platforms.

Perform any 10 Experiments:

1. Verification of Logic Gates
2. Verification of Demorgon's Law
3. Design of 8 to 1 multiplexer
4. Design of 1 to 8 Demultiplexer
5. Design of 2 to 4 Encoder
6. Design of 4-bit comparator
7. Design of 4 bit binary to gray converter
8. Design of full adder using 3 modeling styles
9. Design of flip flops SR, D, JK, and T
10. Design Ripple Counter
11. Design Modulo Counter
12. Design Shift Register
13. Design Inverter using PMOS / NMOS
14. Design of full adder using decoder and multiplexer
15. Design System using finite state Machine

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EMBEDDED SYSTEM DESIGN LABORATORY

III B.Tech. II Semester **Course Code: A226491**

L	T	P	C
0	0	2	1

COURSE OUTCOMES:

At the end of the course the student should be able to

1. Code the ARM cortex M0+ processor instruction set.
2. Articulate the concept of interfacing I/O devices with FRDM kit.
3. Simulate I/O Devices with Arduino using Tinkercad
4. Simulate sensors with Arduino using Tinkercad
5. Formulate a system design using Embedded technologies

Perform any 10 Experiments:

Note: perform below experiments using FRDM Boards/Tinkercad Simulation.

1. Study of FRDM Development Board
2. Blinking of LED using FRDM Kit
3. Breath out 2 LEDs using FRDM Kit
4. Color Circle using FRDM Kit
5. Interface to Accelerometer sensor using FRDM kit
6. LED intensity control using touch sensor using FRDM kit
7. Simulate Potentiometer with Arduino using Tinkercad.
8. Simulate servomotor with Arduino using Tinkercad.
9. Simulate Ultrasonic sensor with Arduino using Tinkercad.
10. Simulate LDR with Arduino using Tinkercad.
11. Simulate 2-wire LCD with Arduino using Tinkercad.
12. Simulate SPI LCD with Arduino using Tinkercad.

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DIGITAL SIGNAL PROCESSING LABORATORY

III B.Tech. II semester **Course Code: A226492**

L	T	P	C
0	0	2	1

COURSE OUTCOMES:

At the end of the course the student should be able to

1. Formulate programs for performing time & frequency operation on signals and systems.
2. Design and implement impulse response filters and Multirate system for a given sequence
3. Analyze and Observe Magnitude and phase characteristics (Frequency response Characteristics) of digital IIR-Butterworth, Chebyshev filters
4. Analyze and Observe Magnitude and phase characteristics (Frequency response Characteristics) of digital FIR filters using window techniques
5. Develop various DSP Algorithms using MATLAB Software package

Note: Minimum 10 Experiments have to be conducted

1. Generation of Sinusoidal Waveform / Signal based on Recursive Difference Equations.
2. To find DFT / IDFT of given DT Signal.
3. To find Frequency Response of a System given in Transfer Function/ Differential equation form.
4. Implementation of FFT of given Sequence.
5. Determination of Power Spectrum of a given Signal(s).
6. Implementation of LP FIR Filter for a given Sequence/Signal.
7. Implementation of HP IIR Filter for a given Sequence/Signal.
8. Generation of Narrow Band Signal through Filtering.
9. Generation of DTMF Signals.
10. Implementation of Decimation Process.
11. Implementation of Interpolation Process.
12. Implementation of I/D Sampling Rate Converters.
13. Step and Ramp Response of First order and Second Order Systems.

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GENDER SENSITIZATION

III B.Tech. II Semester **Course Code: A226019**

L	T	P	C
2	0	0	0

Course Outcomes

At the end of the course the student should be able to

1. Students will have developed a better understanding of important issues related to gender in contemporary India.
2. Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
3. Students will acquire insight into the gendered division of labour and its relation to politics and economics.
4. Men and women, students and professionals will be better equipped to work and live together as equals.
5. Students will develop a sense of appreciation of women in all walks of life through social media and literature.

Unit-I: UNDERSTANDING GENDER

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men-Preparing for Womanhood. Growing up Male. First lessons in Caste.

Unit – II: GENDER ROLES AND RELATIONS

Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles- Gender Roles and Relationships Matrix-Missing Women-Sex Selection and Its Consequences- Declining Sex Ratio. Demographic Consequences-Gender Spectrum: Beyond the Binary

Unit – III: GENDER AND LABOUR

Division and Valuation of Labour-Housework: The Invisible Labor- "My Mother doesn't Work." "Share the Load."-Work: Its Politics and Economics -Fact and Fiction. Unrecognized and unaccounted work.-Gender Development Issues-Gender, Governance and Sustainable Development-Gender andHuman Rights-Gender and Mainstreaming

Unit – IV: GENDER - BASED VIOLENCE

The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment: Say No!-Sexual Harassment, not Eve-teasing- Coping withEveryday Harassment- Further Reading: "*Chupulu*".

Domestic Violence: Speaking Out Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Thinking about Sexual Violence Blaming the Victim-"I Fought for my Life…."

Unit – V: GENDER AND CULTURE

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues- Gender Sensitive Language-Gender and Popular Literature - Just Relationships: Being Together as Equals Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Rosa Parks-The Brave Heart.

TEXTBOOK

"*Towards a World of Equals: A Bilingual Textbook on Gender*" written by A. Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu and published by **Telugu Akademi, Hyderabad**,Telangana State in the year **2015**.

REFERENCE BOOKS:

1. Menon, Nivedita. Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012
2. Abdulali Sohaila. "*I Fought For My Life…and Won*."Available online at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/

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MICROWAVE AND OPTICAL COMMUNICATIONS

IV B.Tech. I Semester **Course Code: A227431**

L	T	P	C
3	1	0	3

COURSE OUTCOMES:

At the end of the course the student should be able to

1. Understands the basics of waveguides in the EM wave transmission and waveguide components for microwave frequencies.
2. Classify different types of Microwave Tubes and there functionality
3. Understand a Microwave test bench setup for parameters measurements and study the Microwave Solid State Devices
4. Analyze the concepts of LED, LASER, PIN, and APD's used in optical fibers.
5. Analyze fiber alignment, connectors and splicing methods of optical fibers Evaluate power coupling from transmitter to fibers and design of fiber optic link

UNIT I: WAVEGUIDES AND WAVEGUIDE COMPONENTS:

Microwave Spectrum and Band designation, Rectangular Waveguides - TE/TM mode analysis, Cut-off Frequencies, Dominant and Degenerate Modes, Impossibility of TEM Mode.

Waveguide Components: Attenuators-Resistive Card, Rotary Vane types, scattering matrix parameters: Properties, S- parameters of E-Plane, H-Plane, Magic TEE Junctions and Directional coupler, Ferrite Components - Faraday Rotation Law, Isolator, Circulator.

UNIT II: MICROWAVE TUBES:

Limitations and Losses of conventional Tubes at Microwave Frequencies, Re-entrant Cavities**,**

O-TYPE TUBES : 2 Cavity Klystrons – Velocity Modulation and Bunching process, Reflex Klystrons – Structure, principle of working.

HELIX TWTS: Significance, Types and Characteristics of Slow Wave Structures; Structure and operation of TWT.

M-TYPE TUBES
Introduction, Magnetrons – 8-Cavity Cylindrical Travelling Wave Magnetron.

UNIT III: MICROWAVE SOLID STATE DEVICES& MEASUREMENTS

MICROWAVE MEASUREMENTS: Description Of Microwave Bench- Different Blocks, Microwave Power Measurement-. Measurement of Attenuation, VSWR & Impedance

MICROWAVE SOLID STATE DEVICES -TEDs – Introduction, Gunn Diodes –RWH Theory, Characteristics, Modes of Operation.

UNIT IV: BASICS OF OPTICAL FIBER COMMUNICATION

Block diagram of Optical Communication, Total Internal Reflection, Numerical Aperture, Cut off wavelength, Optical Fiber types- Step index fiber, Graded index fiber, Losses in Optical Fiber cables, Optical Sources- LED, LASERS, Optical Detectors- Avalanche photodiode, PIN photodiode. (Qualitative treatment).

UNIT V: OPTICAL FIBER CONNECTORS & SYSTEM DESIGN

OPTICAL FIBER CONNECTORS-Connector types, Single mode fiber connectors, Connector Return loss, Fiber Splicing- Splicing techniques, Splicing single mode fibers, Multimode fiber Joints, single mode fiber joints.

OPTICAL SYSTEM DESIGN - Point to point links –Link power budget, Line coding in Optical links, WDM, Eye pattern.

TEXT BOOK:

1. Samuel Y. Liao, Microwave Devices and Circuits, Pearson, 2003.
2. Kulkarni M , Microwave and Radar Engineering , UMESH Publications, 2003
3. Optical Fiber Communication Principle & Practice, John M Senior, Pearson Publications, 3rd edition.

REFERENCES BOOKS:

1. David M. Pozar, Microwave Engineering, John Wiley, 2011.
2. Raghuvanshi G S, Microwave Engineering, Cengage Learning, 2012.
3. Optical Fiber Communication- Gerd Keiser, TMH, 4th Ed., 2008.

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ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

IV B.Tech. I Semester **Course Code: A227432**

L	T	P	C
3	0	0	3

COURSE OUTCOMES:

At the end of the course the student should be able to

1. Acquire knowledge in Characteristics of Instruments, measurement of electrical quantities
2. Measure and analyze the signals using CRO.
3. Study the performance electronic systems using signal generators and wave analyzers
4. Acquire knowledge on Transducers and understanding their applications in real time world
5. Understanding the storing data of non-electrical and electrical quantities

UNIT-I: MEASUREMENTS AND MEASURING SYSTEMS:

Functional Diagram of Instrumentation System, Static characteristics: Accuracy - Precision – Resolution – Sensitivity – measurement Errors, Dynamic Characteristics: Speed of response – fidelity – Lag - Dynamic error - Statistical Analysis, Basic meter movement, DC Ammeters: Multi-range, DC voltmeters: Multi-range, AC voltmeters: Rectifier type - Thermocouple Type, Ohmmeters: Series type and Shunt type, Multimeter

UNIT-II: OSCILLOSCOPES:

Oscilloscope block diagram, Cathode Ray Tube, Vertical Deflection System, Delay Line, Horizontal Deflection System, Dual Beam CRO, Dual Trace CRO, Measurements with CRO: Amplitude – Time period - Frequency – Phase, Lissajous patterns, Sampling Oscilloscope, Analog Storage Oscilloscope, Digital Storage Oscilloscope.

UNIT-III: SIGNAL GENERATORS AND SIGNAL ANALYZERS:

Signal Generators:

AF Sine & Square wave generator, Function generators, RF signal generators, Sweep frequency generator.

Signal analyzers:

Wave analyzers: Frequency Selective Wave Analyzer - Heterodyne Wave Analyzer - Application of Wave Analyzers, Total Harmonic Distortion, Spectrum Analyzer.

UNIT-IV: TRANSDUCERS:

Classification of Transducers, Strain gauges, Capacitive Transducers, Linear Variable Differential Transducer (LVDT), Piezoelectric Transducer, Thermocouple, Thermistor, Measurement of Displacement, Velocity, Acceleration, Vibration, Force, Pressure, Fluid Flow, Liquid Level and Temperature.

UNIT-V: BRIDGES AND RECORDERS:

Bridges:

Wheat Stone Bridge, Kelvin Bridge, Maxwell Bride, Schering Bridge and Wien Bridge

Recorders:

Magnetic disk and tape Recorders, LED, LCD, Dot matrix display, Strip Chart Recorder, X-Y Recorder

TEXT BOOKS:

1. Albert D. Helfrick, Cooper William D, Modern Electronic Instrumentation and Measurement Techniques, Prentice-Hall of India, 1997.
2. Kalsi H S, Electronic instrumentation, Tata Mcgraw Hill, 2015.

REFERENCE BOOKS:

1. David A. Bell, Electronic Instrumentation & Measurements, Prentice-Hall, 2003.
2. Sawhney A K, PuneetSawhney , A Course in Electrical and Electronic Measurements and Instrumentation, Dhanpat Rai & Company, 2016

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RADAR SYSTEMS

(Professional Elective-III)

IV B.Tech. I Semester **Course Code: A227433**

L	T	P	C
3	0	0	3

COURSE OUTCOMES:

At the end of the course the student should be able to

1. Understand the concepts of radar fundamentals, noise analysis and evaluation of radar.
2. Differentiate various types of radar transmitters and receivers.
3. Relate the different types of radar transmitter and receiver.
4. Categorize the type of radar system and noise analysis based on applications.
5. Correlate the different methods of Radar Reception and Receivers

UNIT – I:

Basics of Radar:

Introduction- Maximum Unambiguous Range- Radar Waveforms-- Radar Block Diagram and Operation- Radar Frequencies and Applications. Prediction of Range Performance-Minimum Detectable Signal- Receiver Noise.

Radar Equation:

Simple and Modified form of Radar Range Equation with Illustrative Problems - SNR- Envelop Detector-False Alarm Time and Probability- Integration of Radar Pulses- Radar Cross Section of Targets (simple targets - sphere- cone-sphere)- Transmitter Power- PRF and Range Ambiguities- System Losses (qualitative treatment)- Illustrative Problems.

UNIT – II:

CW and Frequency Modulated Radar:

Doppler Effect- CW Radar – Block Diagram- Isolation between Transmitter and Receiver- Non-zero IF Receiver- Receiver Bandwidth Requirements- Applications of CW radar- Illustrative Problems.

FM-CW Radar:

Range and Doppler Measurement- Block Diagram and Characteristics- FM-CW altimeter- Measurement Errors- Multiple Frequency CW Radar

UNIT – III:

MTI and Pulse Doppler Radar:

Introduction- Principle- MTI Radar with Power Amplifier Transmitter and Power Oscillator Transmitter- Delay Line Cancellers – Filter Characteristics- Blind Speeds- Double Cancellation- Staggered PRFs- Range Gated Doppler Filters- MTI Radar Parameters- Limitations to MTI Performance- MTI versus Pulse Doppler Radar.

UNIT – IV:

Tracking Radar:

Tracking With Radar- Sequential Lobing- Conical scan-Mono pulse Tracking Radar-Amplitude Comparison Mono pulse (One-And Two-Coordinates)-Phase Comparison Monopulse- Tracking In Range- Acquisition and Scanning Patterns- Comparison Of Trackers.

UNIT – V:

Detection of Radar Signals in Noise:

Introduction- Matched Filter Receiver-Response Characteristics and Derivation- Correlation Function and Cross-Correlation Receiver- Efficiency of Non-Matched Filters- Matched Filter with Non-White Noise.

Radar Receivers:

Noise Figure and Noise Temperature- Display-Types- Duplexers-Branch types And Balanced type- Circulators as Duplexers. Introduction to Phased Array Antennas-Basic concepts-Radiation Pattern- Beam Steering and Beam Width changes- Advantages and Limitations-Applications.

TEXT BOOKS:

1. Merrill I. Skolnik , Introduction to radar systems, Tata McGraw Hill special Indian edition, 2007.
2. Kulkarni M , Microwave and Radar Engineering , UMESH Publications, 2003

REFERENCE BOOKS:

1. Byron Edde, Radar: Principles, Technology, Applications, Pearson, 2004**.**
2. Peyton Z. Peebles, Radar Principles, Wiley, 1998.

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CMOS ANALOG IC DESIGN
(Professional Elective-III)

IV B.Tech. I Semester **Course Code: A227434**

L	T	P	C
3	0	0	3

Course Outcomes

After studying the course, each student is expected to be able to

1. Design basic building blocks of CMOS Analog ICs.
2. Carryout the design of single and two stage operational amplifiers and voltage references.
3. Determine the device dimensions of each MOSFETs involved.
4. Design various amplifiers like differential, current and operational amplifiers.
5. Understand the Characterization of Comparator.

UNIT - I

MOS Devices and Modeling

The MOS Transistor, Passive Components- Capacitor & Resistor, Integrated circuit Layout, CMOS Device Modeling - Simple MOS Large-Signal Model, Other Model Parameters, Small-Signal Model for the MOS Transistor, Computer Simulation Models, Sub-threshold MOS Model.

UNIT - II

Analog CMOS Sub-Circuits

MOS Switch, MOS Diode, MOS Active Resistor, Current Sinks and Sources, Current Mirrors-Current mirror with Beta Helper, Degeneration, Cascode current Mirror and Wilson Current Mirror, Current and Voltage References, Bandgap Reference.

UNIT- III

CMOS Amplifiers

Inverters, Differential Amplifiers, Cascode Amplifiers, Current Amplifiers, Output Amplifiers, High Gain Amplifiers Architectures.

UNIT-IV

CMOS Operational Amplifiers

Design of CMOS Op-Amps, Compensation of Op-Amps, Design of Two-Stage Op-Amps, Power-Supply, Rejection Ratio of Two-Stage Op-Amps, Cascode Op-Amps, Measurement Techniques of OP-Amp.

UNIT - V

Comparators

Characterization of Comparator, Two-Stage, Open-Loop Comparators, Other Open-Loop Comparators, Improving the Performance of Open-Loop Comparators, Discrete-Time Comparators.

TEXT BOOKS:

1. Philip E. Allenand Douglas ,R.Holberg – CMOS Analog Circuit Design, Oxford University Press, International Second Edition/Indian Edition,2010.
2. Paul R.Gray, Paul J.Hurst, S. Lewis and R.G.Meyer -Analysis and Design of Analog Integrated Circuits, 5th edition, WileyIndia, 2010.

REFERENCE BOOKS:

1. David A.Johns, Ken Martin- Analog Integrated Circuit Design, Wiley StudentEdn, 2013.
2. Behzad Razavi – Design of Analog CMOS Integrated Circuits, TMH.
3. Baker, Liand Boyce – CMOS Circuit Design, Layout and Simulation, PHI.

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ARTIFICIAL NEURAL NETWORKS
(Professional Elective-III)

IV B.Tech. I Semester **Course Code: A227435**

L	T	P	C
3	0	0	3

COURSE OUTCOMES:

Upon completing this course, the student will be able to

1. Explore the similarity of Biological networks and Neural networks
2. Perform the training of neural networks using various learning rules.
3. Demonstrate the concepts of forward and backward propagations.
4. Construct the Hopfield models.
5. Demonstrate essence of Neuro Dynamics and Hopfield Models.

UNIT-I

Introduction: A Neural Network, Human Brain, Models of a Neuron, Neural Networks viewed as Directed Graphs, Network Architectures, Knowledge Representation, Artificial Intelligence and Neural Networks

Learning Process: Error Correction Learning, Memory Based Learning, Hebbian Learning, Competitive, Boltzmann Learning, Credit Assignment Problem, Memory, Adaption, Statistical Nature of the Learning Process

UNIT-II

Single Layer Perceptrons: Adaptive Filtering Problem, Unconstrained Organization Techniques, Linear Least Square Filters, Least Mean Square Algorithm, Learning Curves, Learning Rate Annealing Techniques, Perceptron –Convergence Theorem, Relation Between Perceptron and Bayes Classifier for a Gaussian Environment

Multilayer Perceptron: Back Propagation Algorithm XOR Problem, Heuristics, Output Representation and Decision Rule, Computer Experiment, Feature Detection

UNIT-III

Back Propagation: Back Propagation and Differentiation, Hessian Matrix, Generalization, Cross Validation, Network Pruning Techniques, Virtues and Limitations of Back Propagation

Learning, Accelerated Convergence, Supervised Learning

UNIT-IV

Self-Organization Maps (SOM): Two Basic Feature Mapping Models, Self-Organization Map, SOM Algorithm, Properties of Feature Map, Computer Simulations, Learning Vector Quantization, Adaptive Patter Classification

UNIT-V

Neuro Dynamics: Dynamical Systems, Stability of Equilibrium States, Attractors, Neuro Dynamical Models, Manipulation of Attractors as a Recurrent Network Paradigm

Hopfield Models – Hopfield Models, restricted Boltzmann machine.

TEXT BOOKS:

1. Simon S Haykin - Neural Networks a Comprehensive Foundations, PHI
2. Jacek M. Zurada - Introduction to Artificial Neural Systems, JAICO Publishing House, 2006.

REFERENCE BOOKS:

1. Li Min Fu - Neural Networks in Computer Intelligence, TMH 2003
2. James A Freeman David M S Kapura - Neural Networks, Pearson , 2004.
3. B. Vegnanarayana -Artificial Neural Networks, Prentice Hall of India P Ltd, 2005

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NETWORK SECURITY AND CRYPTOGRAPHY
(Professional Elective-IV)

IV B.Tech. I Semester **Course Code: A227436**

L	T	P	C
3	0	0	3

COURSE OUTCOMES:

At the end of the course the student should be able to

1. Describe network security fundamental concepts and principles
2. Encrypt and decrypt messages using block ciphers and network security technology and protocols
3. Analyze key agreement algorithms to identify their weaknesses
4. Identify and assess different types of threats, malware, spyware, viruses, vulnerabilities
5. Analyze IP Security, firewall and viruses.

UNIT- I:

Introduction: Security Services, Mechanisms and Attacks, A Model for Internetwork security, Classical Techniques: Conventional Encryption model, Steganography, Classical Encryption Techniques.

Modern Techniques: Simplified DES, Block Cipher Principles, Data Encryption standard, Strength of DES, Block Cipher Design Principles.

UNIT- II:

Encryption: Triple DES, International Data Encryption algorithm, Blowfish, RC5, Characteristics of Advanced Symmetric block Ciphers. Placement of Encryption function, Traffic confidentiality, Key distribution, Random Number Generation

UNIT – III

Public Key Cryptography: Principles, RSA Algorithm, Key Management, Diffie-Hellman Key exchange, Elliptic Curve Cryptography

Number Theory: Prime and Relatively prime numbers, Modular arithmetic, Fermat's and Euler's theorems, Testing for primality, Euclid's Algorithm, the Chinese remainder theorem, Discrete logarithms.

UNIT- IV

Message Authentication and Hash Functions: Authentication requirements and functions, Message Authentication, Hash functions, Security of Hash functions and MACs.

Hash and Mac Algorithms: MD-5, Message digest Algorithm, Secure Hash Algorithm.

Digital signatures and Authentication protocols: Digital signatures, Authentication Protocols, Digital signature standards.

Authentication Applications: Kerberos, Electronic Mail Security: Pretty Good Privacy, SIME/MIME.

UNIT – V:

IP Security: Overview, Architecture, Authentication, Encapsulating Security Payload, Key Management. Web Security: Web Security requirements, Secure sockets layer and Transport layer security, Secure Electronic Transaction.

Intruders, Viruses and Worms: Intruders, Viruses and Related threats.

Fire Walls: Fire wall Design Principles, Trusted systems.

TEXT BOOKS:

1. Cryptography and Network Security: Principles and Practice - William Stallings, Pearson Education.
2. Network Security: The complete reference, Robert Bragg, Mark Rhodes, TMH,2004.

REFERENCE BOOKS:

1. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education.
2. Fundamentals of Network Security by Eric Maiwald (Dreamtech press)
3. Principles of Information Security, Whitman, Thomson.
4. Introduction to Cryptography, Buchmann, Springer.

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SATELLITE COMMUNICATIONS
(Professional Elective-IV)

IV B.Tech. I Semester **Course Code: A227437**

L	T	P	C
3	0	0	3

COURSE OUTCOMES:

At the end of the course the student should be able to

1. Demonstrate the historical background, basic concepts and frequency allocations for satellite communications.
2. Compare and contrast between various multiple accesses systems for satellite communication system.
3. Understand the propagation effects of signal in Satellite transmission
4. Design of satellite links for specified CNR.
5. Visualize satellite subsystems like telemetry, tracking, command and monitor power systems etc.

UNIT-I:
Introduction to Satellite Communication:
Principles and architecture of satellite Communication, Brief history of Satellite systems, advantages, limitations, applications and frequency bands used for satellite communication.
Orbital Mechanics:
Orbital equations, Kepler's laws, Apogee and Perigee for an elliptical orbit,
evaluation of velocity, orbital period, angular velocity etc. of a satellite, concepts of Solar day and Sidereal day. Placement of Satellite in a Geo-stationary orbit

UNIT-II:
Satellite sub systems:
Attitude and orbit control system, TT& C subsystem, control subsystem, power systems, communication subsystems, satellite antenna equipment
Satellite link:
Basic Transmission Theory, System noise temperature and G/T ratio, Basic link analysis, Interference analysis , Design of satellite links for a specified C/N (with and without frequency reuse), Link budget

UNIT – III:
Propagation effects:
Introduction, Atmospheric Absorption, Cloud attenuation, Tropospeheric and Ionospheric scintillation and low angle fading, Rain induced attenuation, Rain induced cross polarization interference.

Multiple Access:
Frequency division multiple access(FDMA), inter modulation, calculation of C/N, Time division multiple access(TDMA) – frame structure, Burst structure, Satellite switched TDMA, on-board processing, Demand Assignment multiple Access (DAMA), CDMA spread spectrum transmission and reception.

UNIT – IV:
Earth station Technology:
Transmitters, Receivers, Antenna, Tracking systems, Terrestrial interface, Power test methods, Lower orbit considerations. Satellite Navigation and Global Positioning systems: radio and satellite navigation, GPS position location principles, GPS receivers

UNIT – V:
Typical Phenomena in Satellite Communication:
Solar Eclipse on satellite and its effects, Remedies for Eclipse, Sun Transit Outage phenomena, its effects and remedies, Doppler frequency shift phenomena and expression for Doppler shift.

TEXT BOOKS:
1. Timothy pratt, Charles Bostian, Jeremy Allnutt , Satellite communications, John Wiley, 2003
2. Pritchand, Satellite communications engineering, Pearson, 1993.

REFERENCE BOOKS:
1. Madhavendra Richharia, Satellite communications: Design principles, Macmillan,2017
2. Tri T. Ha , Digital satellite communications, McGraw-Hill, 1990

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BIOMEDICAL INSTRUMENTATION
(Professional Elective-IV)

IV B.Tech. I Semester **Course Code: A227438**

L	T	P	C
3	0	0	3

COURSE OUTCOMES:

At the end of the course the student should be able to

1. Summarize the requirement of biomedical instrumentation and adversity involved in human measurement.
2. Understand the concept of Bio Potentials in a Human Body
3. Utilize the concept of electrode and its responses used in real time.
4. Outline the divergent responses involved in cardiovascular and respiratory system.
5. Compare the various processes involved in bio telemetry.

UNIT-I:

Introduction:

The age of Biomedical Engineering, Development of Biomedical Instrumentation, Man–Instrumentation system, Components, Physiological system of the body, Problem encountered in measuring a living system. Transducers & Electrodes: The Transducers & Transduction principles, Active transducers, Passive Transducers, Transducer for Biomedical Applications.

UNIT-II:

Sources of Bioelectric potentials:

Resting & Action potentials, propagation of active potential, The Bioelectric potentials-ECG, EEG, EMG, and Invoked responses Electrodes: Electrode theory, Biopotential Electrodes–Microelectrodes Body surface electrodes, Needle Electrodes, Biochemical Transducers, Reference electrodes, PH electrodes, Blood Gas electrodes.

UNIT-III:

Cardiovascular Measurements:

Electrocardiography – ECG amplifiers, Electrodes & leads, ECG recorders - Three channel, Vector Cardiographs, ECG system for stress testing, Continuous ECG recording (Holterrecording), Blood pressure measurement, Blood flow measurement, Heart sound measurements. Patient Care & Monitoring- Elements of Intensive Care monitoring, patient monitoring displays, Diagnosis, Calibration & Reparability of patient monitoring equipment, pacemakers & Defibrillators

UNIT-IV:

Measurements in Respiratory system:

Physiology of respiratory system Measurement of breathing mechanics- Spiro meter, Respiratory Therapy equipment's: Inhalators ventilators & Respirators, Humidifiers, Nebulizers & Aspirators. Diagnostic Techniques: Ultrasonic Diagnosis Echocardiography, Echo Encephalography, Ophthalmic scans, X-Ray & Radio-isotope Instrumentation, Computerized Axial Tomography Scanners

UNIT-V:

Bio Telemetry:

The components of Biotelemetry system Implantable units, Telemetry for ECG measurements during exercise, for Emergency patient monitoring. Physiological Effects of Electric Current Safety of Medical Electronic Equipments, Shock hazards from Electrical equipment and prevention against them

TEXT BOOKS:

1. LeslieCormwell, Biomedical Instrumentation and Measurements, Prentice Hall India,1980
2. Arumugam M, Biomedical Instrumentation, Anuradha Publications, 1994

REFERENCE BOOKS:

1. Khandpur R.S, Biomedical Instrumentation, Tata McGraw-Hill, 2003 .
2. Willis J Tompkins, Biomedical DSP: C Language Examples and Laboratory Experiments for the IBM PC, Prentice Hall India, 2006.

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PRINCIPLES OF SIGNAL PROCESSING
(Open Elective–III)

IV B.Tech. I Semester **Course Code: A227439**

L	T	P	C
3	0	0	3

Course Outcomes Upon completing this course, the student will be able to

1. Differentiate various signal functions.
2. Understand the characteristics of linear time invariant systems.
3. Understand the concepts of sampling theorem and signal to noise ratios.
4. Understanding the Concept of Z-Transform of a Discrete Sequence and systems
5. Demonstrate the effect of Noise on signals.

UNIT I: Signal Analysis:

Introduction to Signals and Systems, Classification of Signals and systems, Exponential and Sinusoidal signals, Concepts of Impulse function, Unit Step function, Signum function, Operation on signals.

UNIT II: Signal Transmission through Linear Systems Linear System:

Impulse response, Response of a Linear System, Linear Time Invariant (LTI) System, Linear Time Variant (LTV) System, Transfer function of a LTI System, Signal bandwidth, System Bandwidth, Ideal LPF, HPF, and BPF characteristics, Convolution and Correlation of Signals, Concept of convolution in Time domain and Frequency domain,

UNIT III: Sampling theorem:

Sampling theorem for band limited signals, Impulse Sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, Effect of under sampling – Aliasing, Introduction to Band Pass Sampling.

UNIT IV: Z-Transforms:

Concept of Z-Transform of a Discrete Sequence, Distinction between Laplace, Fourier and Z Transforms,

Region of Convergence in Z-Transform, Constraints on ROC for various classes of signals, Inverse Z-transform, Properties of Z-transforms.

UNIT V: Noise:

Introduction to Noise, Resistive/Thermal Noise Source, Shot Noise Sources, Effective Noise Temperature, Noise equivalent bandwidth, Average Noise Figures, Average Noise Figure of cascaded networks.

TEXT BOOKS:

1. Signals, Systems & Communications - B.P. Lathi, B.S. Publications, 2013.

2. Probability, Random Variables & Random Signal Principles - Peyton Z. Peebles, TMH, 4 th Ed., 2001.

REFERENCES:

1. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawabi, 2 Ed.

2. Statistical Theory of Communication – S.P Eugene Xavier, New Age Publications, 2003

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COMMUNICATION TECHNOLOGIES
(Open Elective–III)

IV B.Tech. I Semester **Course Code: A227440**

L	T	P	C
3	0	0	3

Course Outcomes: Upon completing this course, the student will be able to

1. Understand the information theory and its coding styles.
2. Acquire knowledge on satellite communication and broadcasting services.
3. Know GSM, LTE and 5G mobile networks.
4. Know about network security through encryption and decryption.
5. Understand the principles of Encryption and Authentication.

UNIT I:

INFORMATION THEORY: Shannon Capacity, Multimedia Data, Data Processing, Boolean Logics, Information Content, Entropy, Source Coding, Channel Coding, Modulation Schemes, Internet.

UNIT II:

WIRELESS COMMUNICATION TECHNOLOGIES: WLAN, Wifi, Bluetooth, Other Wireless PAN And WAN Technologies, Satellite Communications, Broadcast Services.

UNIT III:

CELLULAR MOBILE NETWORKS: GSM (2G), UMTS (3G), LTE (4G), 5G Mobile Networks, Mobile Network Planning Aspects.

UNIT IV:

FREE SPACE OPTICAL COMMUNICATIONS: Optical fiber, FTTC, FTTH, FTTBS, Free Space Optical Link, Channel Model with Different Factors, Deep Space Optical Communications.

UNIT V:

NETWORK SECURITY AND MANAGEMENT: Symmetrical Encryption, Asymmetrical Encryption, Authentication, Hash-Value, Integrity Check, Telecommunications Management Network, SNMP, Functionalities of Network Management, Trends and Future Development.

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TEXT BOOKS:

1. Shun-Ping Chen, "Fundamentals of Information and Communication Technologies" 2020
2. B.P. Lathi, "Communication systems"- BS Publications, 2006.

REFERENCES:

1. Simon Haykin, John Wiley "Digital Communications" 2005.
2. Herbert Taub, Donald L Schilling Gautham Saha "Principles of Communication systems" 3rd edition McGraw-Hill 2008.

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IOT FOR REAL TIME APPLICATIONS
(Open Elective–III)

IV B.Tech. I Semester **Course Code: A227441**

L	T	P	C
3	0	0	3

COURSE OUTCOMES:

At the end of the course the student should be able to

1. Design remote data sensing and aggregation system for health care
2. Develop energy efficient IoT systems for smart cities
3. Design Precision agricultural systems
4. Develop smart automation system for Industries
5. Investigate various IoT based innovative systems for societal benefits

UNIT I:

IoT FOR HEALTHCARE:

Architecture of IoT for Healthcare, IoT based Health Monitoring System using Arduino,Smart continuous glucose monitoring(CGM)and insulin pens ,Remote Patient Monitoring- IoT Heart Rate Monitoring, remote monitoring of physiological parameters, ECG, EEG, Diabetics and BP.

UNIT II:

IoT ENABLED SMARTCITIES:

Energy Consumption Monitoring, Smart Energy meters to minimize power consumptions, Smart home powered by IoT, Smart Grid and Solar Energy Harvesting, Intelligent Parking System

UNIT III:

IoT FOR SMARTAGRICULTURE:

Animal Intrusion detection in farms, soil moisture detection and Irrigation system, Pest monitoring and control, Livestock monitoring system, IoT based Greenhouse Environment Monitoring and controlling.

UNIT IV:

IoT BASED INDUSTRIAL AUTOMATION:

IoT based gas leakage monitoring system, Temperature and liquid level monitoring in boilers, Fire detection system, wireless video surveillance robot, Automatic Solar Tracker

UNIT V:

IoT FOR SOCIETY:

Medical Waste Management, Weather update system with IoT Women security system,GPS Smart Sole, wearable glove to enables into speech conversation, IoT based air pollution meter

TEXT BOOKS:

1.Fadi Al-Turjman, Intelligence in IoT- enabled Smart Cities, 2019, 1st edition, CRC Press, ISBN-10:1138316849

2. Giacomo Veneri, and Antonio Capasso, Hands-on Industrial Internet of Things: Create a powerful industrial IoT infrastructure using Industry 4.0, 2018, Packt Publishing.

REFERENCES BOOKS:

1. Krishna P. Venkata, Sasikumar Gurumoorthy, Mohammad S.Obaidat, Internet of Things and PersonalizedHealthcareSystems,Springer-2019.

2. Pattnaik, PrasantKumar, Mohanty, Suneeta, Mohanty, Satarupa, SmartHealth care Analytics in IoT Enabled Environment, Springer-2020.

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MICROWAVE AND OPTICAL COMMUNICATIONS LABORATORY

IV B.Tech. I Semester **Course Code: A227493**

L	T	P	C
0	0	4	2

COURSE OBJECTIVES

At the end of the Course, the students able to

1. Understand the behavioral aspects of various microwave sources
2. Analyze the measurement procedures of important parameters in microwave engineering.
3. Evaluate the S-Parameters of various three and four port devices
4. Understand the characteristics of various optical sources.
5. Measure the losses, intensity modulation for the analog optical fiber and data rate for digital Optical fiber.

Note: Any **12** of the following experiments

LIST OF EXPERIMENTS:

1. Reflex Klystron Characteristics
2. Gunn Diode Characteristics
3. Directional Coupler Characteristics
4. VSWR Measurement
5. Measurement of Waveguide Parameters
6. Measurement of Scattering parameters of a Magic Tee
7. Measurement of Scattering parameters of a Circulator
8. Attenuation Measurement
9. Characterization of LED.
10. Characterization of Laser Diode.
11. Intensity modulation of Laser output through an optical fiber.
12. Measurement of Data rate for Digital Optical link.
13. Measurement of Numerical Aperture of fiber cable.
14. Measurement of losses for Optical link

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ARTIFICIAL INTELLIGENCE
(Professional Elective–V)

IV B.Tech. II Semester **Course Code: A228442**

L	T	P	C
3	0	0	3

COURSE OUTCOMES:

At the end of course, the student will be able to

1. Understand the basics of the theory and practice of Artificial Intelligence as a discipline and about intelligent agents.
2. Explain search techniques and gaming theory.
3. Learn to apply knowledge representation techniques and problem solving Strategies to common AI applications.
4. Understand the basic ideas of software agents utilized in Artificial Intelligence.
5. Illustrate the basic applications of Artificial Intelligence.

UNIT I:

Introduction–Definition – History & overview of Artificial Intelligence, Applications - Future of Artificial Intelligence – Characteristics of Intelligent Agents–Typical Intelligent Agents – Problem Solving Approach to Typical AI problems.

UNIT II:

Problem solving Methods – Search Strategies- Uninformed and Informed – Heuristics – Uninformed Search: depth first search, breadth first search - Heuristic Search Strategies: Greedy Best First Search, A* Search - Beyond Classical Search: Hill-climbing search, Simulated annealing search.

UNIT III:

Knowledge Representation First Order Predicate Logic – Unification – Forward Chaining-Backward Chaining – Resolution – Knowledge Representation – Ontological Engineering-Categories and Objects – Events – Mental Events and Mental Objects – Reasoning Systems for Categories -Reasoning with Default Information

UNIT IV:

Software Agents Architecture for Intelligent Agents – Agent communication –Negotiation and Bargaining – Argumentation among Agents – Trust and Reputation in Multi-agent systems.

UNIT V:

Applications: AI applications – Language Models – Information Retrieval- Information Extraction – Natural Language Processing – Machine Translation – Speech Recognition.

TEXT BOOKS:

1. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach, Prentice Hall, Third Edition, 2009.
2. Artificial Intelligence: A Modern Approach, 4th Edition, Stuart Russell, peter Norvig University of California at Berkeley, Pearson education, 2020.

REFERENCES:

1. M. Tim Jones, ―Artificial Intelligence: A Systems Approach (Computer Science), Jones and Bartlett Publishers, Inc.; First Edition, 2008
2. Nils J. Nilsson, ―The Quest for Artificial Intelligence, Cambridge University Press, 2009.

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5G AND BEYOND COMMUNICATIONS
(Professional Elective–V)

IV B.Tech. II Semester

Course Code: A228443

L	T	P	C
3	0	0	3

COURSE OUTCOMES:

At the end of the course the student should be able to

1. Understand basic concepts of MIMO systems
2. Contrast among Mobile Wireless Technologies
3. Demonstrate the channel effects in radio wave propagation.
4. Recite the Design Considerations for mm Wave communication
5. Know the scope of Future Mobile Technologies

UNIT I: Multiple Input Multiple Output (MIMO) Communications:

Spatial Multiplexing, Spatial Diversity, Beamforming in MIMO systems, Hybrid Precoding , 5G Communication Landscape, Related work on 5G.

UNIT II:

Introduction to Mobile Wireless Technology Generations:

5G, WISDOM, GIMVC, Requirements of 5G, standardization of WISDOM, Vision of 5G, WISDOM Concept and Challenges, Cellular D2D Communication, D2D Using Physical Layer Network Coding, Using FFR and Using Cognitive Radio.

SMNAT: Introduction, Network Architecture and the Process, Implementation of SMNAT for In-Band-D2D and Interoperability with WISDOM, Description of Network elements of SMNAT and Call Flow for Session Establishment.

UNIT III:

Radio Wave Propagation for Mm Wave:

Introduction, Large-scale Propagation Channel Effects, Small-Scale Channel Effects, Spatial Characterization of Multipath and Beam Combing, Outdoor Channel Models, Indoor Channel Models.

UNIT IV:

Higher layer Design Considerations for Mm Wave:

Challenges when Networking Mm Wave Devices, Beam Adaptation Protocols, Relaying for Coverage Extension, Support for Multimedia Transmission, Multiband considerations, Performance of Cellular networks, Mm Wave Standardization: ECMA-387, IEEE 802.11ad.

UNIT V: BEYOND 2020

Major Challenges Surrounding Future Cyber Security, Users Awareness, Spectrum Related Security Issues in CRNs. Challenges for 2020 and beyond, Future Mobile Technologies, High Altitude Stratospheric Platform Station Systems, Human Bond Communications, CONASENSE.

TEXTBOOKS:

1. Ramjee Prasad, *5G: 2020 and Beyond* , River Publishers
2. T. S. Rappaport, R. W. Heath Jr., R. C. Daniels, and J. M. Murdock, *Millimeter Wave Wireless Communication*, Pearson Education , 2015.

REFERENCES:

1. M. Manish, G. Devendra, P. Pattanayak, and N. Ha, 5G and Beyond Wireless Systems PHY Layer Perspective, Springer Series in Wireless Technology
2. M. Vaezi, Z. Ding, and H. V. Poor, Multiple Access techniques for 5G Wireless Networks and Beyond, Springer Nature , Switzerland, 2019

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MACHINE LEARNING
(Professional Elective-V)

IV B.Tech. II Semester **Course Code: A228444**

L	T	P	C
3	0	0	3

COURSE OUTCOMES:

After completion of the course student will be able to

1. Understand basics of Artificial Neural Networks computational model.
2. Understand the essentials of feature engineering, state-of-art tools and concepts of machine Learning
3. Design and evaluate different types of supervised learning algorithms for classification and Regression tasks
4. Design and evaluate different types of unsupervised learning algorithms for clustering tasks.
5. Design and evaluate strong learners for better real time prediction ensemble learning Algorithms

UNIT-I:

Artificial Neural Networks: Introduction, Understanding the Biological Neuron, Exploring the Artificial Neuron, Types of Activation Functions, Early Implementations of ANN, Architectures of Neural Network: Single-layer and multi-layer feed forward ANNs, Recurrent network, Learning Process in ANN, Back propagation.

UNIT-II:

Introduction to Machine Learning: What is Machine Learning, Why Machine Learning, Types of Machine Learning models, Challenges of Machine Learning, Applications of Machine Learning, Essential libraries and Tools, Generalization over fitting and under fitting, Bias–variance trade-off, and metrics.

UNIT-III:

Supervised Learning: Classification and Regression, Linear Regression: Single and Multiple, Logistic Regression, K-Nearest Neighbour, Naive Bayes Classifier, Decision Tree.

UNIT-IV:

Unsupervised Learning and Pre-processing: Types of Unsupervised Learning, Challenges in Unsupervised Learning, Applications of Unsupervised Learning, Pre-processing and Scaling, clustering, K-Means Clustering, Agglomerative Clustering.

UNIT-V:

Ensemble Learning and Random Forest: Voting Classifiers, Bagging and pasting, Random Patches and Random subspaces, Random Forest, Boosting-AdaBoost.

TEXT BOOKS:

1. Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das "Machine Learning", Pearson Education India, 2018.
2. Aurélien Géron, "Hands-on Machine Learning with Scikit-Learn, Keras, and TensorFlow Concepts, Tools, and Techniques to Build Intelligent Systems" O'Reilly Media, Inc, 2017.

REFERENCE BOOKS:

1. Andreas C. Müller, Sarah Guido, "Introduction to Machine Learning with Python",O'Reilly Media, Inc, October 2016.
2. Tom M. Mitchell, "Machine Learning", McGraw-Hill Education (India) Private Limited, 2013.
3. Ethem Alpaydin, "Introduction to Machine Learning (Adaptive Computation and Machine Learning)", The MIT Press, 2004.
4. Stephen Marsland, "Machine Learning: An Algorithmic Perspective", CRC Press, 2009.

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MULTIMEDIA DATABASE MANAGEMENT SYSTEMS
(Professional Elective–VI)

IV B.Tech. II Semester **Course Code: A228445**

L	T	P	C
3	0	0	3

Course Outcomes

At the end of the course the student should be able to

1. Gain knowledge of fundamentals of DBMS, database design and normal forms
2. Master the basics of SQL for retrieval and management of data.
3. Be acquainted with the basics of transaction processing and concurrency control.
4. Familiarity with database storage structures and access techniques
5. Understand the indexing in multimedia DBMS

UNIT - I

Database System Applications: A Historical Perspective, File Systems versus a DBMS**,** the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS

Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design With the ER Model

UNIT - II

Introduction to the Relational Model: Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical data base design, introduction to views, destroying/altering tables and views.

Relational Algebra**,** Tuple relational Calculus, Domain relational calculus.

UNIT - III

SQL: Queries, Constraints, Triggers: form of basic SQL query, UNION, INTERSECT, and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and active data bases.

Schema Refinement: Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functional dependencies, FIRST, SECOND, THIRD normal forms, BCNF, lossless join decomposition, multi-valued dependencies, FOURTH normal form, FIFTH normal form.

UNIT - IV

Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for serializability, Lock Based Protocols, Timestamp Based Protocols, Validation- Based Protocols, Multiple Granularity, Recovery and Atomicity, Log–Based Recovery, Recovery with Concurrent Transactions.

UNIT - V

Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree base Indexing, Comparison of File Organizations, Indexes and Performance Tuning, Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM), B+ Trees: A Dynamic Index Structure.

TEXT BOOKS:

1. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, *Tata Mc Graw Hill* 3rd Edition
2. Database System Concepts, Silberschatz, Korth, *Mc Graw hill*, V edition.

REFERENCE BOOKS:

1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
2. Fundamentals of Database Systems, ElmasriNavrate, *Pearson Education*
3. Introduction to Database Systems, C. J. Date, *Pearson Education*
4. Oracle for Professionals, The X Team, S.Shah and V. Shah, *SPD*.
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL,Shah, *PHI*.
6. Fundamentals of Database Management Systems, M. L. Gillenson, *Wiley Student* Edition.

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SYSTEM ON CHIP ARCHITECTURE
(Professional Elective–VI)

IV B..Tech. II Semester **Course Code: A228446**

L	T	P	C
3	0	0	3

Course Outcomes:

At the end of the course the student should be able to

1. Expected to understand SOC Architectural features.
2. Acquire the knowledge on processor selection criteria and limitations
3. Acquires the knowledge of memory architectures on SOC.
4. Understands the interconnection strategies and their customization on SOC.
5. Elaborate Reconfiguration Technologies in SOCA.

UNIT – I:

Introduction to the System Approach: System Architecture, Components of the system, Hardware & Software, Processor Architectures, Memory and Addressing. System level interconnection, An approach for SOC Design, System Architecture and Complexity.

UNIT – II:

Processors: Introduction, Processor Selection for SOC, Basic concepts in Processor Architecture, Basic concepts in Processor Micro Architecture, Basic elements in Instruction handling. Buffers: minimizing Pipeline Delays, Branches, More Robust Processors, Vector Processors and Vector Instructions extensions, VLIW Processors, Superscalar Processors.

UNIT – III:

Memory Design for SOC: Overview of SOC external memory, Internal Memory, Size, Scratchpads and Cache memory, Cache Organization, Cache data, Write Policies, Strategies for line replacement at miss time, Types of Cache, Split – I , and D – Caches , Multilevel Caches, Virtual to real translation , SOC Memory System , Models of Simple Processor – memory interaction.

UNIT - IV:

Interconnect Customization: Inter Connect Architectures, Bus: Basic Architectures, SOC Standard Buses, Analytic Bus Models, Using the Bus model, Effects of Bus transactions and contention time. SOC Customization:

UNIT – V:

Configuration: An overview, Customizing Instruction Processor, Reconfiguration Technologies, Mapping design onto Reconfigurable devices, Instance - Specific design, Customizable Soft Processor, Reconfiguration - overhead analysis and trade-off analysis on reconfigurable Parallelism.

TEXT BOOKS:

1. Computer System Design System-on-Chip by Michael J. Flynn and Wayne Luk, Wiely India Pvt. Ltd.
2. ARM System on Chip Architecture – Steve Furber –2nd Ed., 2000, Addison Wesley Professional.

REFERENCE BOOKS:

1. Design of System on a Chip: Devices and Components – Ricardo Reis, 1st Ed., 2004, Springer
2. Co-Verification of Hardware and Software for ARM System on Chip Design (Embedded Technology) – Jason Andrews – Newnes, BK and CDROM
3. System on Chip Verification – Methodologies and Techniques –Prakash Rashinkar, Peter Paterson and Leena Singh L, 2001, Kluwer Academic Publishers.

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WIRELESS SENSOR NETWORKS
(Professional Elective–VI)

IV B.Tech. II Semester **Course Code: A228447**

L	T	P	C
3	0	0	3

COURSE OUTCOMES:

Upon completion of the course, the student will be able to:

1. Analyze and compare various architectures of Wireless Sensor Networks
2. Understand Design issues and challenges in wireless sensor networks
3. Analyze and compare various data gathering and data dissemination methods.
4. Design, Simulate and Compare the performance of various routing and MAC protocol
5. Understand the design considerations of WSN

UNIT -I:

Introduction to Sensor Networks, unique constraints and challenges, Advantage of Sensor Networks, Applications of Sensor Networks, Types of wireless sensor networks

UNIT - II:

Mobile Ad-hoc Networks (MANETs) and Wireless Sensor Networks, Enabling technologies for Wireless Sensor Networks. Issues and challenges in wireless sensor networks

UNIT - III:

Routing protocols, MAC protocols: Classification of MAC Protocols, S-MAC Protocol, B-MAC protocol, IEEE 802.15.4 standard and ZigBee

UNIT -IV:

Dissemination protocol for large sensor network. Data dissemination, data gathering, and data fusion; Quality of a sensor network; Real-time traffic support and security protocols.

UNIT -V:

Design Principles for WSNs, Gateway Concepts Need for gateway, WSN to Internet Communication, and Internet to WSN Communication. Single-node architecture, Hardware components & design constraints, Operating systems and execution environments, introduction to TinyOS and nesC.

TEXT BOOKS:

1. Ad-Hoc Wireless Sensor Networks- C. Siva Ram Murthy,B. S. Manoj, Pearson
2. Principles of Wireless Networks – Kaveh PahLaven and P. Krishna Murthy, 2002, PE

REFERENCE BOOKS:

1. Wireless Digital Communications – Kamilo Feher, 1999, PHI.
2. Wireless Communications-Andrea Goldsmith, 2005 Cambridge University Press.
3. Mobile Cellular Communication – GottapuSasibhushana Rao, Pearson Education, 2012.
4. Wireless Communication and Networking – William Stallings, 2003, PHI.